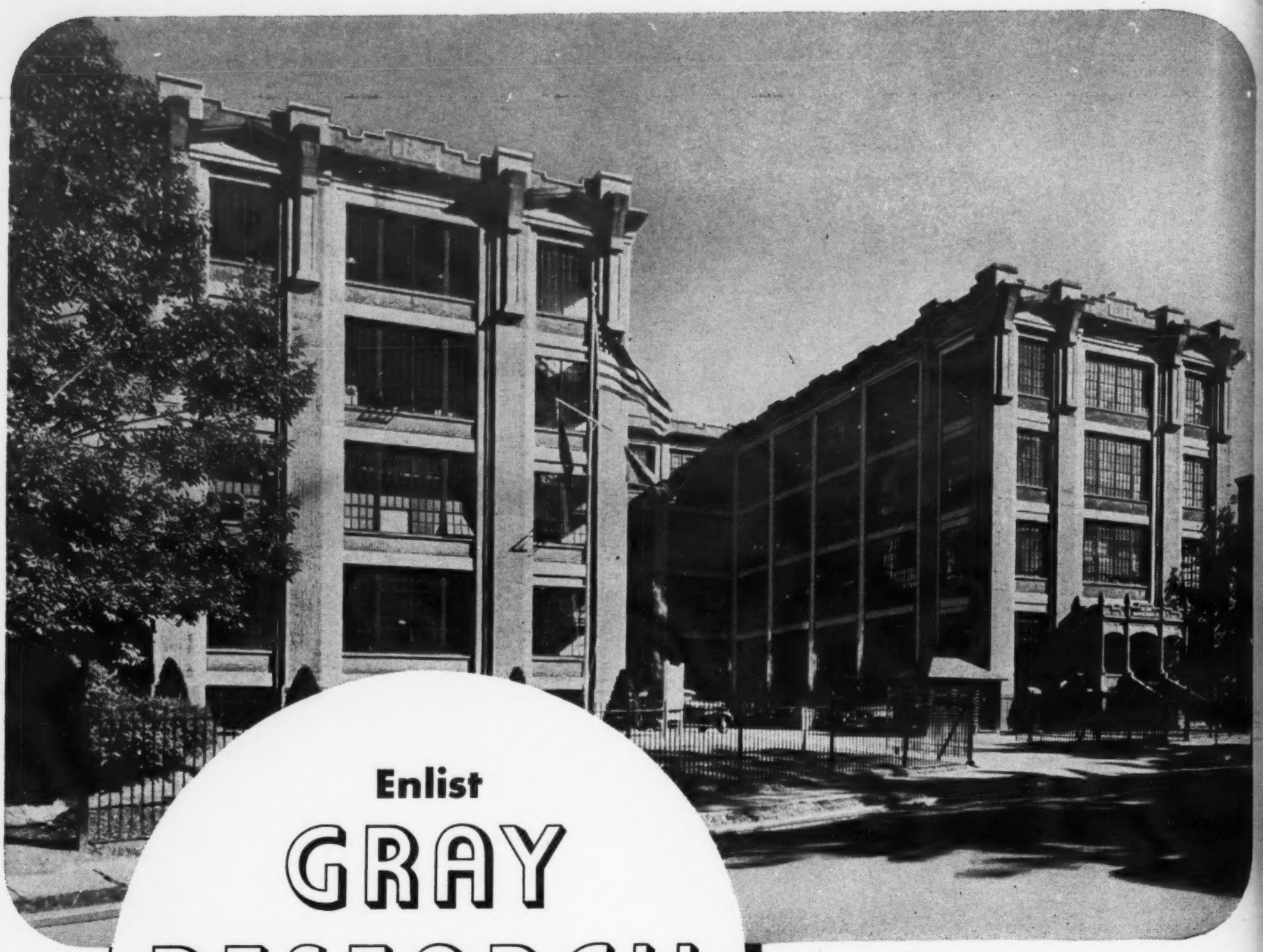
NPA's William Henry Harrison



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THE COVER

Pictured on our cover is National Production Authority Administrator William Henry Harrison, President of the IT&T Corp., wartime Signal Corps major general, and one of the AFCA's strongest supporters. See News Section for report on NPA.

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Transmitters
Microwave Links and Relays
Transmitting Antennas
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NAVAL ELECTRONICS

In blackest night a broadside slams away straight to the target, easily visible to the eye of radar.

The combat center, such as that of the USS Ancon shown to the left, is outfitted with a mass of the most modern radar and communications equipments.

A Naval task force, consisting of battleships, carriers, cruisers, and escort vessels steams at high speed, with no lights showing, through glassy-smooth waters in the South Pacific. On board these ships are thousands of men, older men with years of experience, young boys on their first sortie in hostile waters. All are manning their battle stations, for the task force commander has been told to expect strong enemy forces in the vicinity. Suddenly in the dimly-lighted radar room on one of the battleships a young operator calls out "targets bearing 060 degrees range 23,000 yards."

This information is quickly relayed to the bridge of the battleship and to other ships in the task force. All ships are alerted and ordered to stand by for action by the task force commander. Engineers are told to be prepared for flank speed, gunners are told to stand by to load and everything is ready for the crucial test to come. Slowly the range closes—22,000 yards, 21,500 yards, 21,000 yards—all guns are bearing on the invisible target—invisible except to the magic eye of science—*electronics*. Suddenly there crackles over the short range high-frequency radio an order from the task force commander personally—"Open fire when ready." Almost immediately a battleship fires a broadside, a second broadside follows the first, then a second battleship opens with a broadside.

The tracers on the shells can be seen to arch through the dark night, slowly settle toward the water—then terrific explosions light up the sky, over 10 miles away, and if one is observing the radar he sees the target echoes slowly diminish in amplitude on the radar screen, and in only a few minutes all that remains is a wavering green line, the normal sweep on the cathode-ray tube. Thus it went throughout the war, enemy ships being detected, tracked, fired on and sunk without their knowing that their presence had been detected by the sixth sense of man—*Radar*.

Millions of people have read descriptive stories such as the above in newspapers and magazines, but how many of them stopped to think of the unwritten story behind such unbelievable feats. Such events as that described above are not just a result of hit-or-miss guesswork—they are the result of long years of research, experimentation, and unselfish devotion to the cause by countless thousands of military and civilian scientists and engineers.

Courtesy: *Electron (Navy publ.)*

Many years ago the Navy realized the tremendous importance of wireless communication from ship to shore, ship to ship, and shore to shore. It was a medium for transmitting vital information rapidly and thus presented a decided advantage in strategic situations. In the early years of this century, arc and spark transmitting equipment with comparable receiving equipment was being employed by Naval ships and stations. Progress was steady but slow through those first years of the art, but the Navy was ever pressing for improved communication facilities.

The transition period from the arc-spark-crystal days to the highly complex equipment employed in the past few years embraced many significant advances: TRF receivers, crystal controlled transmitters, electron-coupled oscillator applications, high-frequency communications, multi-channel transmitters and receivers, remote transmitter and receiver control facilities, airborne equipments of various types, direction finding equipment, and many others equally as important in the program.

In the late 1930's, scientists and engineers of the Navy were working on a revolutionary electronic development, which if successful would change the course of military history. This project was highly secret at that time and little was learned of it until shortly before the outbreak of World War II, when initial tests had been completed and it was deemed ready for shipboard evaluation and operation.

This new development has since become a byword in every American home and all the people of this great nation can thank those farsighted scientists and engineers for pursuing the elusive

goal of *radar* (RAdio Detection And Ranging), for this was the weapon which was highly instrumental in our decisive victory in the recently concluded conflict.

However, *radar* alone did not accomplish all the electronic miracles during those years, there were others such as coordinated radio communications using the latest developments in that field, *sonar* (SOund Navigation And Ranging) for use in undersea warfare, and many less important equipment which contributed to the overall superiority of our Naval forces.

The man on the street did not realize any personal benefit from this multi-billion dollar industry during the war years because practically all electronic developments were considered military secrets and protected as such. However, the money spent by the armed forces, led by the Navy, was actually contributing to the improved living conditions which we are now realizing.

Innumerable developments of both Naval and civilian scientists and engineers during those years between 1941 and 1946 have since been applied directly to commercial products. These products embrace many fields—entertainment, medicine, nuclear physics, mathematics and the associated sciences.

There is little reason to doubt that the tremendous investments in the electronics program during the war have advanced commercial electronics many years ahead of what it would be had there been no war. This is not to condone war, but only to point out that the Naval electronics program through its own requirements and investments has aided private industry to advance more rapidly.

Without the working capital, scientific research, technical know-how and initiative developed during those war years, we very probably would not have available today such devices as black and white television, colored television, advanced principles of broadcast and FM radio, and the numerous machines dedicated to the health and welfare of mankind. At least those machines, if available, would not be within the reach of the average citizens of the country as they now are.

Naval Electronics Organization

The Naval electronics organization is a far flung and vast network, encompassing scientific research and development at laboratories, electronic maintenance and upkeep at Naval shipyards, maintenance training at various schools, active operation and maintenance on board the units of the fleet and in Naval aircraft, actual operational evaluation of new electronic instruments, and last but not least logistic support of all these activities through an elaborate electronic supply organization. The center of this bustling activity is located in the Navy Department in Washington, D. C.

Actually, there are three electronics organizations in the Naval electronics program, one located in the Bureau of Ships, a second in the Bureau of Ordnance and a third in the Bureau of Aeronautics. As most of us know, electronics has grown so rapidly in the past few years that it has become impossible for any one person or agency to keep abreast of the latest developments in all the fields of the science in an organization as large as the Navy.

Each of the three Bureau organizations has problems which are peculiar to that bureau only and bear little relation to the problems of the others. However, there are many items of common interest to all the electronics personnel of the Navy and these are handled jointly by the three Bureaus when occasion demands.

The electronics organization of the Bureau of Ships is divided into four divisions; 1—Design and Development, 2—Logistics, 3—Shore and 4—Ship, Marine Corps and Amphibious. These are combined to form the electronics divisions of the Bureau of Ships. Each of the four divisions is under the direction of a responsible officer, proficient in his field and well qualified for that assignment. Overall direction of the electronics divisions is exercised by the assistant chief of the Bureau of Ships for Electronics.

Design and Development Division

The design and development division is responsible to the assistant chief of the Bureau of Ships for Electronics and the assistant chief of the Bureau of Ships for Research and Development, for directing the planning and the execution of plans for applied research, design, development, test and evaluation of electronics systems, equipments, assemblies, sub-assemblies and component parts and their related auxiliarv devices designed for Naval use aboard ship and ashore. In addition, the design and development division is responsible for the prosecution of programs of an investigative nature required to support this mission.

This division plans, implements and supervises electronics applied research, design, development, test, and evaluation of programs including radio, radar, sonar, radiac, photic, cryptographic, electronic counter-measures, special applications, and related auxiliary systems, as approved by the Chief of Naval Operations and the research and development board and as coordinated with counterpart agencies within the national military establishment.

These programs are designed to meet the material requirements in fulfillment of the responsibilities of the Chief of the Bureau of Ships. The responsibility of the division includes the preparation and control of electronics manufacturing specifications, electronic systems, functional sketch plans, electronic systems engineering integration and coordination, electronic equipment manufacturers' drawings, technical review of electronic systems and electronic equipment manufacturers' drawings, technical review of electronic systems and electronic equipment instruction books and electronics manuals prepared by the several electronics divisions, as well as standardization criteria for electronic circuit component parts.

This division is responsible for maintaining technical records of research and development programs, and for budget preparations, justifications and allocation of electronic research and development funds together with such management and fiscal data as is necessary to effect adequate control of this program.

Logistics Division

The logistics division, under the supervision of the assistant chief of the Bureau of Ships for Electronics, accomplishes the following for all electronics material under the cognizance of the electronics divisions: 1—Determines the total requirements for electronics divisions, 2—Directs procurement and contract planning, 3—Supervises the preparation and justification of budgets, 4—Supervises industrial relations, including production, 5—Maintains control of inventories and stock, issue and disposition, 6—Prepares planning for mobilization and war preparedness, and 7—Exercises maintenance of fiscal control.

In addition, under the direct supervision of the director of the logistics division, the division maintains close liaison with the Bureau of Supplies and Accounts, maintains liaison with all field activities on supply matters concerning electronics material, places representatives at conferences with other departments where electronics material supply problems are discussed, and in general furnishes advice and assistance to all activities concerned with electronics on the immediate and planned logistics program.

Ship, Marine Corps and Amphibious Division

The ship, Marine Corps and amphibious Division is charged with directing the planning of installation, maintenance, and allowances of electronic equipments and systems, under the cognizance of the assistant chief of the Bureau of Ships for Electronics, for Naval ships and amphibious applications. This division also exercises authority over Marine Corps electronic equipment in accordance with Bureau of Ships doctrines.

The division's responsibilities are broken down into several groups defined as follows: 1—Establish electronic equipment and system maintenance parts allowances for all Naval activities utilizing electronic equipment under Bureau of Ships cognizance, 2—Standardize and properly identify maintenance parts of Bureau of Ships electronic equipment, 3—Furnish technical advice regarding electronic components and parts to the electronic supply officer, 4—Supervise the recommendations, review, revision, compilation and dissemination of electronic equipment and system allowances for Naval ship and

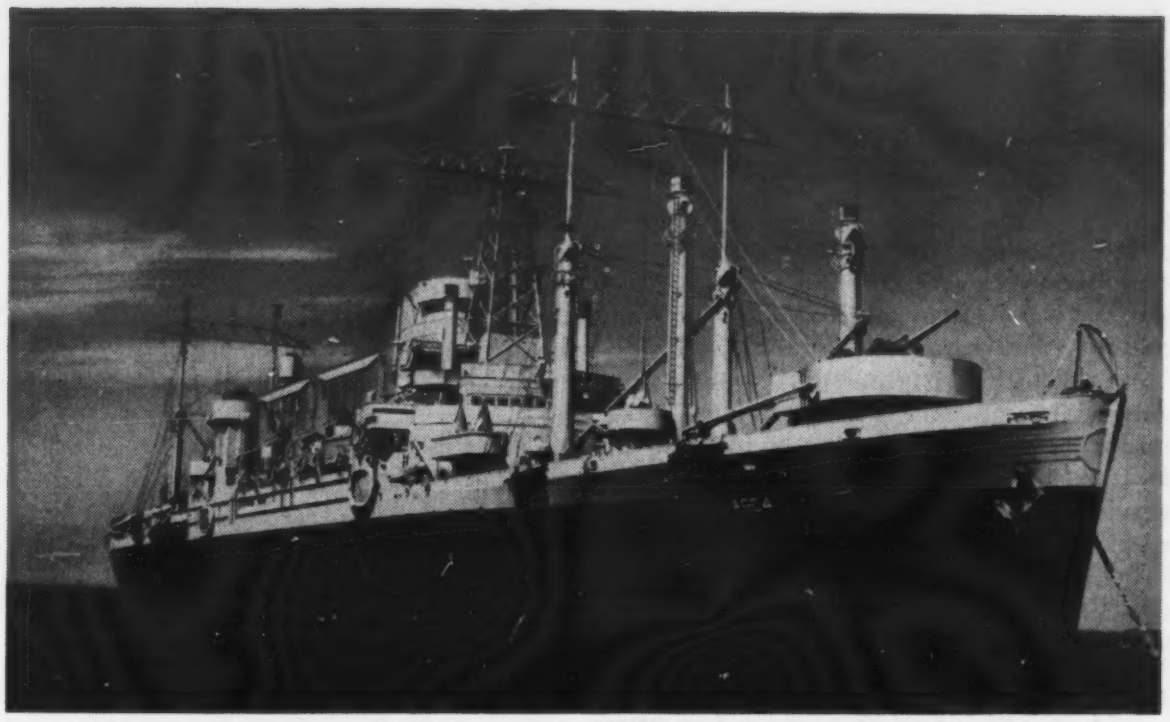
amphibious applications, 5—Supervise the planning of installation and maintenance of electronic equipments and systems for Naval ship and amphibious applications, 6—Plan the maintenance, repair, alteration, and modification of all Naval ship and amphibious electronic equipment and systems, 7—Perform application engineering including technical analysis of electronic equipment characteristics and operational reports with the view of extending the application of these equipments to shipboard installation, 8—Plan maintenance and application engineering of Marine Corps electronic equipment, 9—Maintain a program to keep constantly appraised of the material condition of electronic equipment and systems installed in ships of the reserve fleet, as well as keeping abreast of the amount of electronic equipment, testing instruments, funds, etc. necessary to bring ships of the reserve fleet up to approved allowances, 10—Make recommendations relative to the technical aspects of electronics installation and maintenance training, 11—Coordinate special electronics engineering services provided by contractors, naval shipyards, electronics officers and special groups, 12—Coordinate all electronics publications, including maintaining working files of instruction books for electronic equipments and systems, and 13—Provide drafting services for electronics publications and associated requirements.

Shore Division

The shore division is responsible to the assistant chief of the Bureau of Ships for Electronics for the installation and maintenance and systems engineering of electronic equipment at all Naval shore activities. This responsibility embraces all the Naval radio stations engaged in point-to-point and general fleet broadcast service; fixed aeronautical communications at Naval air and Marine Corps air stations; all electronic navigational aid equipment employed at fixed installations throughout the Naval service; and the engineering plans and allowances for use at Naval advanced base activities.

The electronics shore division consists of four branches, each of which is charged with a portion of the responsibilities outlined above. The duties of each branch are briefly outlined in the following paragraphs.

The principal mission of the facilities management engineering branch is to exercise managerial supervision of the installation, maintenance, and improvement of Naval shore-based electronic facilities both fixed, portable, mobile, and transportable at continental and overseas locations. This branch is divided into sections consisting of groups of engineers who have the responsibility of providing engineering services to particular types of electronics activities such as radio communication stations, areonautical radio communication facilities, internal security and industrial control radio, radio installations for



Designed to serve as communications centers AGC's such as the USS Ancon, shown above, are equipped with complex and up-to-date communications devices including the latest radar equipment.

regular Navy and Naval Reserve training activities, electronic repair shops and laboratories, and electronic search and guidance facilities.

The search, guidance, and instrumentation systems engineering branch prepares type installation plans for the use of field activities in making specific installation plans and estimating costs on such installations as ground controlled intercept facilities; command operations centers for training of C.O.C. operators, officers and teams; radar traffic control systems; air navigational aids; radiation detectors, identifiers, indicators and computers; sound detection and ranging equipment; magnetic detecting equipment; surface search radar; photo-electronic detection, ranging and signalling equipment; weather tracking radar; radar identification equipment; and industrial electronic equipment.

The advanced base electronics facilities engineering branch is responsible for selecting certain equipments or systems approved by the Chief of Naval Operations, or indicating other equipments or systems for developmental action and/or prototype layout to meet the operational requirements of advanced base facilities from the standpoint of sound electronic engineering principles. This requires that each branch engineer be thoroughly familiar with the progress of both military and civilian research and development in electronics and allied fields.

Coupled with this engineering planning is the task of preparing the detailed lists of all the installation and maintenance parts and material—weeding out all duplications and non-essential items while insuring that no essentials are omitted. At the same time, sufficient information such as stock numbers, descriptive data, etc., must be applied to each of the several thousand items in order that supply activities may readily assemble from their stocks, the systems ordered by the advance base commanders.

The communication systems engineering branch is responsible for the installation and maintenance of radio and wire line communication equipment including transmitters, receivers, terminal, control, and telegraph equipment—and with radio direction finder equipment and all associated items. Briefly its functions correspond to those of the plant engineering group of any of the large communication carriers or public utility organizations. It deals entirely with problems at shore based communication stations which include long range point-to-point, the shore end of the ship-shore circuits and the ground portion of air-ground circuits. It develops plant requirements to meet the operating requirements established by the Chief of Naval Operations and prepares electronics specifications for construction of new equipment and improvements to existing equipment.

Research

The Naval electronics organization maintains numerous research laboratories, such as the Naval Research Laboratory, Bellevue, D. C., the U. S. Navy Electronics Laboratory, San Diego, Calif., the U. S. Navy Underwater Sound Laboratory, New London, Conn., all under the direct control of the Bureau of Ships; the U. S. Naval Ordnance Laboratory. White Oak, Md. under the direct control of the Bureau of Ordnance; and the Naval Air Test Center, Patuxent, Md., the U. S. Naval Air Missile Test Center, Point Mugu, Calif., and the U. S. Naval Air Development Center at Johnsville, Pa. under the direct control of the Bureau of Aeronautics. There are others, but the above present a good cross section of the Laboratory facilities available for advancing the cause of Naval Electronics.

Obviously, the above laboratories are not identical in make-up or organization, since each is charged with different projects and different types of projects, although facilities are available at

all to undertake basic electronic research and experimentation. As can be deduced from the names listed in the preceding paragraph, certain of the Naval electronics laboratories are maintained primarily for a certain type of electronic research such as, in the case of the underwater sound laboratory, sonar and its applications in undersea warfare. Although the laboratories are not identical in departmental make-up, the personnel assignments, in general, are quite similar. All are operating under certain basic doctrines laid down by the bureau to which they are subservient, as well as broad Naval policies.

BuShips Has Technical Control

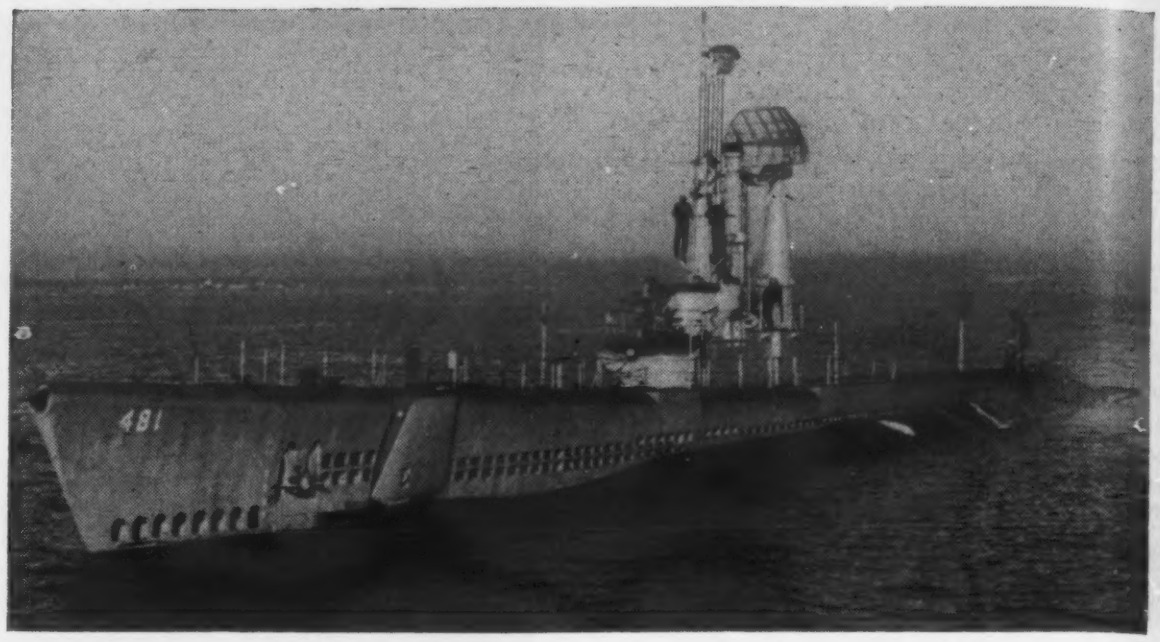
Those laboratories under the direction of the Chief of the Bureau of Ships are each headed by a responsible and capable Naval officer, while civilian scientists, engineers, and other Naval officers constitute the nucleus of the organization. These laboratories are under the technical control of the Bureau of Ships and their work programs are largely determined by the scientific and technical problems assigned by that bureau.

The function of the laboratory is to serve the Chief of the Bureau of Ships in the design, development, procurement, testing and installation planning of fleet electronic equipment. This requires work in theoretical science and basic research; in applied science from design up through production engineering; and in training for the operation and maintenance of electronic equipment.

Usually the complement of a laboratory is approximately equally divided—one-half being professionally trained men and women including physicists, mathematicians, electronics engineers, mechanical engineers, and chemical engineers—with their technical assistants. The remainder of the staff is composed of supporting personnel, such as draftsmen, photographers, machinists, and maintenance and administrative groups.

The assignments given the laboratories are broad, indicating a need for extensive work in a number of fields. They call for a long-term program of system engineering—the study and improvement of all the electronic equipment on ships of the fleet and at shore stations.

These plans call for a continuation of the wartime task of developing, modifying, and testing electronic equipment with the ultimate goal to make our Navy the leader in electronics research, development, and actual application. The program assignments are far-reaching and touch on all the phases of electronics, particularly, radar, radio, sonar, etc. They also encompass research in a considerable number of allied fields including basic physics, mathematics, geology, geophysics, meteorology, marine biology, psychometrics (psychological tests and measurements), accoustical psychology, and electrical and mechanical engineering.



The radar picket submarine is a post war development. It is regarded as a potential strengthening factor in the radar fence around the U. S.

The Laboratories

The Naval Research Laboratory is the oldest of Naval laboratories, being founded in 1923. This laboratory is located in Bellevue, a suburb of Washington, D. C., and an annex to it is located a few miles outside of Washington on Chesapeake Bay. The Naval Research Laboratory is charged with basic design, testing, experimentation, etc. concerned with Naval electronics. The functions of the Chesapeake Bay Annex are to further test and evaluate pre-production and experimental models of various types of electronic equipment. In addition to continued research and consequent advancements in the electronics field, personnel of the laboratory are active in many other fields. A complete photographic laboratory, chemical research division, modern machine shops and foundries are only a few of these activities.

The U. S. Navy Electronics Laboratory, San Diego, Calif., is a wartime-founded institution, being established in 1942 to assist the Bureau of Ships in the field of electronics. This mission is accomplished under general program guidance of the chief of the Bureau of Ships, and under a broad policy that requires a two-way flow of information between the bureau and the laboratory on one hand, and the laboratory and the fleet on the other. It is possible, under this two-way information system, for the laboratory personnel to understand the immediate problems confronting the fleet while at the same time remain aware of the general program requirements as formulated by the chief of the Bureau.

Close contact with the fleet is favored by the laboratory's location at San Diego, Calif. Much of the Pacific Fleet is based at San Diego, so that work in direct support of the fleet is greatly facilitated. Location also favors work at sea in the laboratory submarine and surface ships, which have been specially equipped for research and development investigations. Laboratory personnel have carried out tests and special investigations throughout the Pacific area—from the Antarctic to the Arctic; from the Mariannas to Mexico.

Very broadly, the research and development program of the laboratory embraces four principal fields; sonar, radio, radar, and the human factor in applied electronics. Both applied research and development work are carried out. The research and development program is administered by the director, a Naval captain, and is under the immediate technical direction of a superintending scientist. The research development, and systems engineering divisions carry the bulk of the research and development program.

The U. S. Navy Underwater Sound Laboratory, New London, Conn., was officially founded under its present name in 1945. Broadly speaking, the Underwater Sound Laboratory is a development organization concerned with the investigation and solution of problems in anti- and pro-submarine warfare. While these problems are concerned largely with the field of underwater sound, as the name of the establishment suggests, a number of them fall into certain other fields of electronics.

The technical program of the laboratory is coordinated closely with the program conducted at other Naval research establishments. In formulating and administering this program, the Bureau of Ships is guided by the special advantages afforded by the laboratory, such as contacts with the fleet, sea-going test facilities, excellent shops, and nearness to the ocean test areas. Thus maximum benefit is derived from limited funds, equipment, and personnel.

The technical staff of the laboratory is divided into six operating sections, each under the guidance of a section leader, and a member of supporting groups of a consulting nature. While

they may be expected to overlap one another to some extent, each group consists of a number of specialists devoted to a specific phase of the technical program. As a whole, they represent a highly integrated team, organized for the expeditious accomplishment of the laboratory's mission.

The Electronics Test Division of the Naval Air Test Center, Patuxent, Md., is responsible for conducting engineering tests and investigations to technically evaluate the operating performance of airborne electronic and electrical equipment under laboratory and flight conditions, in order to determine the suitability and value of these equipments for operational use in Naval aircraft. Further, when applicable, the division will determine necessary engineering changes or modifications to the electrical, electronic or mechanical characteristics and construction of the equipment to render it suitable for use and to provide operating characteristics necessary to make this equipment of military value to Naval aircraft.

In carrying out this mission, some 300 civilians are employed in the electronics test division, about one-third of whom are in technical capacities. An additional 200 military personnel are stationed here, principally engaged in flight operations, although a number are scattered throughout the various sections in technical positions. The division consists of three major departments: engineering, all weather aids, and flight operations—plus a small inspection department.

The engineering department, which is the basic unit of the division, employs electronics, electrical and mechanical engineers of all grades, who are trained and generally specialize in particular engineering fields, such as radar, power supplies, radio and communication, antenna, and composite systems operations. The department is under the direct supervision of a civilian chief engineer, who is supported by civilian section heads, with their aides and consultants.

The Naval Air Missile Test Center at Point Mugu, Calif., is located on the Pacific coast. The primary mission of the test center is the testing and evaluation of guided missiles. While supported by the Navy, it also provides facilities for the Air Force, Army, and the Marine Corps, as well as for a large number of contractors who carry out advanced phases of missile development at the center. Physically, it consists of about 4200 acres of land on shore and a number of observation and instrumentation points on islands located off the cost. The field of guided missiles is under intensive development.

In order to extract all the possible information from each flight at Point Mugu, it is necessary to provide very complete instrumentation. This may be considered in two parts, external and internal. The external instrumentation provides data on gross behavior, the position of the missile in space, its velocity and acceleration, the relation between its trajectory and its target. Internal instrumentation covers voltages, pressures, temperatures, and other factors which describe the behavior of components during flight. The application of both the external and internal instrumentation requires a high level of engineering experience.

Communications	*Combat Operations*	*Anti-Submarine Warfare*
Radio	Radar (air and surface search—fire control)	Sonar
Direction Finder	IFF	Depth Finding
Visual Signalling	Navigational System	Sofar and Rafos
Infra-Red	Countermeasures	Harbor Defense
Remote Control and Telemetering	GCA and CCA	Listening Devices
Data Transmission	Display Systems	Underwater Countermeasures
Automatic Transmission	AEW	Sono-buoys
Wire and Terminal		
Radio Navigational Countermeasures		

The U. S. Naval Air Development Center, Johnsville, Pa., comprises three laboratories, one of which is the Aeronautical Electronic and Electrical Laboratory, founded to centralize the responsibility and authority for aircraft electronic and electrical equipment and systems. The development of high speed, high performance aircraft during the war made it imperative that aircraft electronic and electrical systems be designed first as a system, rather than as an assembly of unrelated "black boxes" and second, but equally important, as an integral part of an aircraft design.

The center is organized into three division: development division, test and evaluation division, and the engineering services division. This organization permits the development and test and evaluation engineers to devote their major efforts to the furtherance of projects assigned by the Bureau of Aeronautics, while the burdensome and time-consuming functions such as facilities, publications, administration, and program coordination are assumed by the engineering services division.

The U. S. Naval Ordnance Laboratory at White Oak, Md., represents the ultimate in laboratory facilities available to the Bureau of Ordnance for test, research, evlauation, experimentation, etc. This laboratory was founded in 1929 and originally employed only a handful of employees. At present there are more than 2200 scientists, engineers, technicians, clerical help and shop workers attached to the laboratory. It includes seventy-five buildings and five field test stations dispersed over a 938-acre site in nearby Maryland.

The 2200 employees are under the administrative and military control of a rear admiral, U. S. Navy, and under the technical control of a senior scientist. The facilities of the laboratory are employed by the staff in hundreds of scientific explorations from the development of supersonic guided missiles to the classification of deep sea fish noises, from quality control by radiography to the cultivation of delicate transducer crystals.

This highly diversified program of scientific research and development is geared essentially to one purpose—equipping the U. S. Fleet with the weapons necessary to not only keep it abreast, but ahead, of all other similar organizations. Originally, the laboratory devoted practically all of its efforts and facilities to mines, mine warfare and fuzes. Not until World War II did the laboratory branch out to embrace degaussing operations for American vessels. This involved exporation in the field of terrestrial and electrical magnetism.

Some idea of the diversity of the laboratory program may be gleaned from a partial examination of its record during the past war. 1—Conceived, designed and tested airborne mines which destroyed or damaged two million tons of Japanese shipping during the last three months of hostilities; 2—Developed a series of detectors using the influence field principle for the detection of submerged ordnance. This device enabled the recovery of approximately $60,000,000 worth of torpedoes alone; 3—Adapted the British 40mm antiaircraft fuze to American manufacture with a simplification which saved millions of dollars. This fuze brought down more airplanes than any other fuze used in the war; and 4—Aided by the Bell Telephone Laboratories, the laboratory developed the magnetic airborne detector, which successfully detected and led to the destruction of a number of submarines, and today is proving a great usefulness in geophysical exploration.

But, perhaps what will eventually prove to be NOL's most significant contribution to the security of the United States, is the pattern of cooperation between the military and scientific professions. Thus while NOL is essentially a military establishment, it functions as a scientific organization with youth, foresight, and cooperation resulting from the merging of these two professions.

Naval Shipyards

The Navy maintains numerous Naval shipyards on both coasts of the U. S. and in Hawaii. The administrative make-up of these yards follows, in gen-

eral, a pattern laid down by the Navy Department. Each Naval shipyard includes in its organization an electronics department, headed up by a capable Naval officer, usually a captain or senior commander. The internal organization of the electronics department, from the electronics officer down through the engineers and shop personnel, follows the same general line at all Naval shipyards.

Electronics Officer's Domain

The electronics officers is responsible to the Shipyard commander for the proper functioning of his office, advises and assists him in all matters pertaining to electronics work, supervises field work at all the district electronics activities (regular and reserve), is responsible for technical control and inspection of electronics work and for maintenance of shore radio, radar, sonar and other electronics activities in the district. He maintains liaison with all Naval and commercial electronics activities in the area. He acts as deputy shipyard commander in all matters pertaining to district electronics activities. As deputy planning and production officer, he has supervision over all electronics work in the planning and production departments.

The electronics officer has three immediate section heads subservient to him, the assistant electronics officer for shore, the district reserve electronics officer, and the senior civilian assistant. The assistant for shore is directly responsible to the electronics officer for preliminary design, development, installation and maintenance of all shore electronics activities in the district. He maintains liaison with the commanding officer of the Navy communication stations located in the district, and with officers-in-charge of all district communication stations and electronics activities. In the absence of the electronics officer, the assistant for shore acts in his capacity.

The district reserve electronics officer is assigned to investigate and report on all problems which arise in connection with district reserve electronics activities. He is responsible for the maintenance of equipment records and installation priority schedules concerned with district reserve activities. He maintains liaison with all district reserve electronics activities and with reserve training organizations and programs. The senior civilian assistant directs and coordinates the work of all sections, groups and units of the office, maintains liaison with all heads of departments, divisions and offices of the shipyard and with district electronics activities. He advises and assists the electronics officer and maintains technical and management control over all activities of the office.

The electronics office is divided into three general sections; technical, inspection, and clerical. The technical and inspection sections have wide duties and responsibilities, being sub-divided into four groups to more efficiently allocate those duties and responsibilities.

The installation and maintenance group is responsible for the installation and maintenance of all shore radio, radar, sonar and other electronic equipment at shore electronics activities in the district. They establish suitable schedules of maintenance by station force or shipyard personnel as required, make inspections and tests, calibrate and adjust installed equipment. The progress control group maintains liaison with officers-in-charge of district electronics activities, arranges priority of work, directs the initiation of job orders, prepares correspondence and maintains progress control records.

The ships test group performs all necessary test, calibrations and engineering measurements on shipboard radio, radar, sonar, teletype and other electronic installations. They supervise the work of contract engineers, provide engineering information and data to shipyard shops and other shipyard branches as required. They provide engineering services for all GCA units installed in the district or undergoing overhaul in the shipyard, and perform special engineering work as assigned. The engineering group is responsible for the preliminary planning, development, engineering and design of all shore radio, radar, sonar, teletype and other electronic installations in the district. They supervise the preparation of plans and specifications, provide engineering data and act as technical engineering consultants on all shore station problems.

The electronics shop has been established under the production department, shop superintendents office. This shop is charged with maintenance, repair and upkeep of electronic devices in numerous different fields including teletype and cryptographic repair facilities, instrument repair, crystal grinding radar-RCM-IFF-loran, infra-red equipment repair, radio receivers, radio transmitters, etc.

An outside section of the electronics shop is charged with the removal and installation of electronic equipment on shipboard as well as accomplishing shipboard electronic repairs. Electronics shop personnel, under the direction of an electronics engineer, overhaul all ground-controlled approach (GCA) equipment from all areas in the district. A complete machine shop is maintained for light manufacturing work incident to the repair and installation of electronic equipment. Parts that cannot be procured from commercial sources are manufactured in this section. Fabrication and assembly of complete units is often necessary.

Electronics in the Naval Reserve

In the preceding pages we have discussed those activities concerned with electronics in the active and operating shore and fleet establishments. There is still another phase of naval electronics, the Naval Reserve electronics program, which is administered by Naval Reserve Activities, but receives logistic and administrative support from active Naval organizations.

The purpose of the Naval Reserve is to provide a force of qualified officers and enlisted personnel who are available for mobilization in the event of a national emergency, and who, together with the active and retired personnel of the regular Navy, can effectively meet the needs of the expanding Naval establishment while an adequate flow of newly trained personnel is being established.

The electronics warfare program in the Naval Reserve is designed to accomplish this purpose for electronics personnel requirements as set forth in the mobilization plan. General policies relating to the size, location, organization, administration, training, and mobilization of the Naval Reserve, before being adopted, are submitted to the Secretary of the Navy for approval, via the Chief of Naval Operations.

One of the most important divisions of the Naval Reserve organization is the Naval Reserve electronics warfare unit, consisting of reserve officers and enlisted personnel grouped together at various locations throughout the conti-

Reserve Warfare Unit

nental limits of the U. S. and at certain other locations. The Electronics warfare program of the Naval Reserve is concerned with the training of personnel in three principal operational fields plus training in technical electronics. The three principal operational fields, showing types of equipment involved, are described in the table on the next page.

In addition, technical training will be given in radiological safety devices, missile guidance, electronic training aids, nuclear physics, and related subjects not included in the above listing.

Because the techniques of electronics warfare necessitate the closest cooperation between air, surface and submarine components of the Navy, the same close cooperation is maintained by Naval Reserve air, surface and submarine organizations in order to provide realistic useful training in electronics warfare.

Electronics warfare personnel are trained in both the organized and the volunteer reserve as an integral part of the over-all naval reserve organization. They are assigned to organized reserve divisions, battalions, companies and platoons; and in the volunteer reserve, personnel are organized as electronics warfare companies and platoons. For planning purposes a quota of 500 companies and 750 platoons has been established. Volunteer reserve personnel participate in organized reserve drills and train on a voluntary basis and may be retained on full time status as instructors, station keepers, and/or consultants in the reserve electronics training program.

In addition to reservists assigned to

drilling units described above, individual reservists holding FCC amateur radio operator and station licenses may be issued Navy call signs, publications, and furnished piezo-electric crystals for frequency control of their transmitters. In this manner these reservists may drill in radio procedure, and participate in Naval District emergency and disaster network activity.

A tremendous amount (approximately $200,000,000 worth) of electronic equipment has been made available to the Naval Reserve electronics warfare unit for installation in the various Naval Reserve armories for training in installation, maintenance and operation. Electronics warfare companies and platoons receive substantially the same type allowance of equipment and publications on a comparable basis with the same training as conducted in organized reserve armories. This allowance includes visual equipment, radio, radar, IFF, sonar, and electronic laboratory equipment as well as commercial and Navy publications. The level of training in the Naval Reserve is of the highest order and constant efforts are being made to improve the quality and quantity of material available to the organization for training purposes.

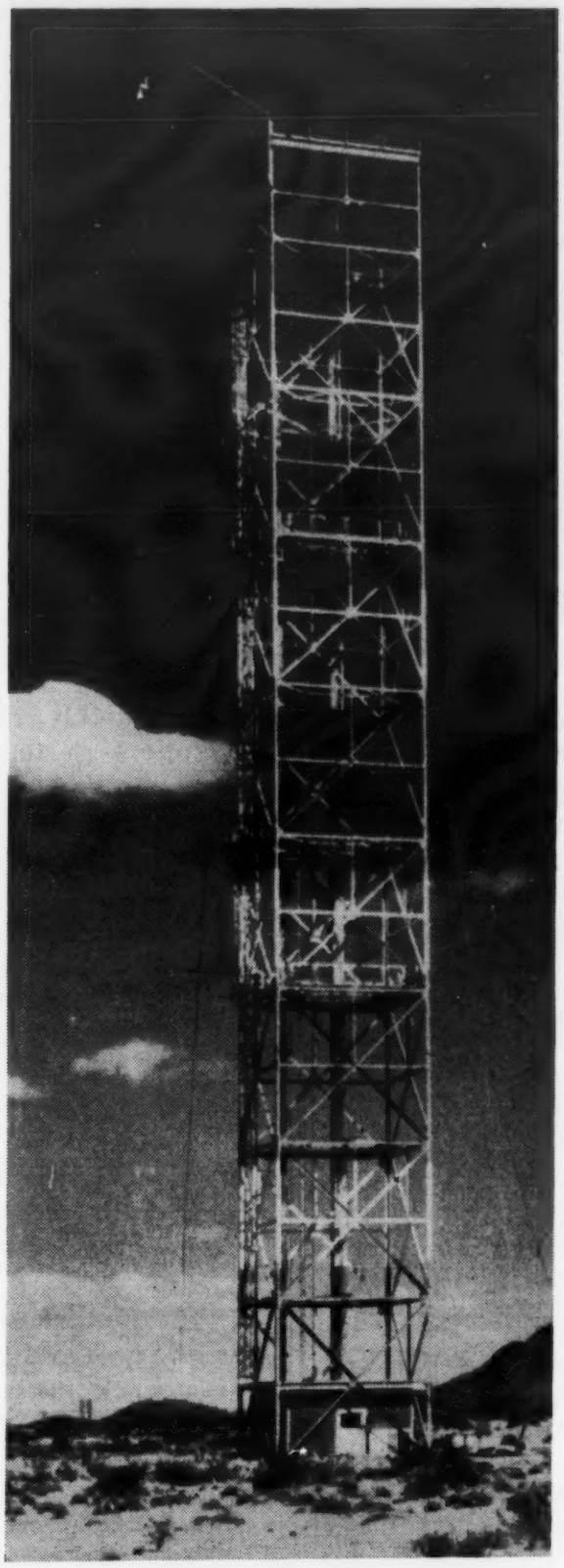
In general, the curricula in Naval Reserve training programs parallels that given for similar ratings in the regular Navy training centers. Training methods include classroom lectures and demonstrations by regular instructors and visiting lectures, maintenance and operation of equipment on both shore-based and shipboard equipment, assignment of laboratory problems and homework, extensive use of training films, recordings and correspondence courses, visits to laboratories (civilian and Naval) and manufacturing plants, and widest possible use of regular Navy activities.

Undoubtedly many people are not aware that the Naval Reserve is a constantly expanding organization, and applications from interested persons are always welcome. Prospective applicants may obtain full information on joining this fast-growing organization from the Naval Reserve activity in any Naval district headquarters.

Training Program

Due to the increasing complexity and quantity of electronic equipment throughout the Naval service, it has been a prime objective of the Navy Department to maintain a high level of technical ability among the officer and enlisted personnel who are assigned to maintain and operate this electronic equipment. To accomplish this objective, a long range training program was initiated and is being prosecuted by the Navy, both for operational and technical personnel. Many radio operator and teletype schools are situated at strategic locations throughout the country to train young men in the art of radio and teletype procedures.

As these young men are graduated, they are assigned to duty at large shore radio stations or on board units of the fleet. Obviously, they are not finished operators upon graduating from the schools and their training continues at their new assignment. It is this principle of on-the-job training which has paid large dividends to the Navy throughout the past years, producing outstanding radio operators and communications experts.



Receiving tower in Arizona desert where Navy scientists' experiments aim at extension of the range of ultra shortwave radio and radar transmission.

In addition to the operators schools, several electronics maintenance schools have been established in the U. S., for both enlisted and officer personnel. It is the mission of these schools to take high "general classification test" boys from the various training centers and over a period of about eight months teach them the fundamentals of mathematics, radio, and a limited amount of more complex electronic equipment such as radar, sonar, etc.

As in the case of operators, these boys upon graduation are assigned to shore establishments (in isolated cases) or to fleet units. Their training continues after arrival at their new assignment, although they are immediately integrated into the shipboard electronics maintenance organization. As they increase in ability and professional knowledge, they are advanced in rating commensurate with this newly acquired ability and knowledge. After a period of some years, depending on the individual, they reach the highest pinnacle in enlisted ranks, chief petty officer. If the individual has the professional ability and the inherent desire, he may go on up to officer rank, through the media of warrant officer and chief warrant officer.

Electronics Assures Career

Thus, each man who enters the Naval service and elects a career in the field of electronics is assured of the possibility of continuous advancement until he reaches the limit of his abilities. The technicians are the men who, during the war, were indirectly responsible for the overwhelming superiority enjoyed by our Naval forces in the application and usage of electronic equipment designed, developed, and produced through the combined efforts of Naval and civilian scientists, engineers, and mass production techniques, facilities and abilities outstanding among American manufacturers.

The Naval electronics organization is not complete without giving a due share of praise to the officers and enlisted personnel who man our ships and stations throughout the world. As in the case of all other departments of the electronics organization, an individual ship or station is also organized to obtain maximum efficiency from the personnel available.

A typical shipboard electronics organization is made up as follows: The electronics officer, usually a lieutenant (junior grade) or lieutenant (senior grade) is in overall charge of the electronics maintenance organization. On large ships he is usually assisted by a warrant officer or chief warrant officer (radio electrician or chief radio electrician) who is directly responsible for the actual maintenance assignments and satisfactory completion of these assignments. The electronics officer is directly responsible to the department head (engineering officer) for the overall functioning of the electronics maintenance organization. In the case of small ships, where no warrant rank is assigned to the ship, the electronics officer is assisted by either a chief petty officer (chief electronics technician) or first class petty officer. Depending on the size of the organization, responsibility and work assignments are made on an equitable basis among the remainder of the technicians.

No organization, operating on so vast a scale as the Naval electronics organization, could function without a complete and thorough logistics support

(*Continued on page 64, col. 1*)

From the President

The Korean emergency stresses the need for careful industry-government planning, President Gary points out, and it is the job of the AFCA to aid in such preparation. The president also notes a rise in AFCA membership.

Since my last message to you in the July-August issue of SIGNAL, interest in the AFCA and its activities has risen to new heights. Gratifying as this development has been to me, I am well aware that it could not have taken place without the support that has been given by our members in all parts of the country, by the members of the various committees, and in particular by George Dixon, our Executive Secretary, upon whose shoulders has fallen so much of the responsibility for coordination of our efforts.

That this interest and cooperation are beginning to bear fruit is clearly shown by the fact that since mid-year 560 new members have joined the AFCA, while the number of group members has been increased by seven. Also, you have been seeing, or will be seeing, several new advertisers in SIGNAL'S pages. This is a good trend, and I know it is just the beginning of what can be done if our efforts continue on the same generous scale, as I feel sure they will.

While it is now obvious that in the initial stages of the Korean war, our forces were handicapped by lack of manpower, by inadequate preparation and coordination, and by shortages of equipment, their ability to shake out the postwar cobwebs and measure up to the needs of the situation has helped in the writing of one more chapter of glorious history.

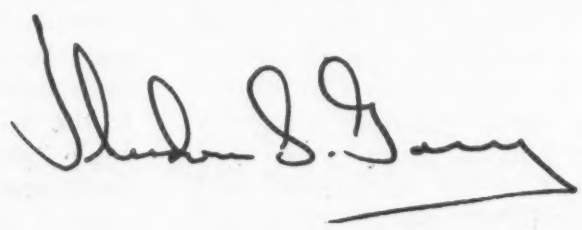
It has become painfully evident that one of the greatest factors for success in any such operation is to insure having equipment available in sufficient quantities, and at the right time and the right place. This re-emphasizes the need for careful planning well in advance both by industry and by the procurement agencies. In this planning we of the AFCA can and must do our part.

If there has been some fear that the recent successes of our forces in Korea might cause a letdown in vigilance or give rise to any doubt that the needs of the services will continue at a high level, those doubts have been quickly dispelled by the response of suppliers in the communications, electronics and photographic fields to the demands for service in reactivated camps and bases at home and abroad.

Fortunately many of our suppliers in these industries have never lost contact with the armed services since the close of World War II, though of course on a much reduced scale. More recently they have been gearing themselves in a most efficient fashion to meet the needs of current mobilization both for the armed services and for civilian defense. Thus in many cases their problems of defense production have become problems of diversion and expansion rather than problems of conversion.

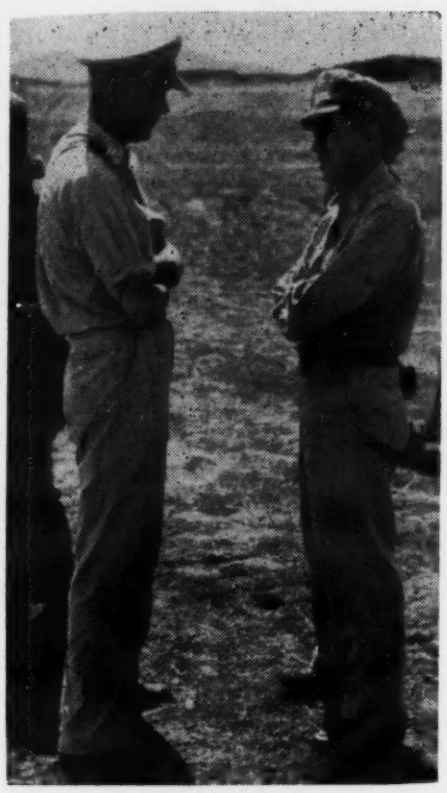
In the broad fields of communication, it is the job of the AFCA to assist in getting this work done by encouraging cooperation both by individuals and by companies with their fellow members in the armed services—to help them see that the needs are met on time, and that every dollar of outlay is spent wisely and soundly.

I should like to take this opportunity also to remind all members of the AFCA of our plans for the 1951 convention. I recently met with the directors of the Chicago chapter who have the responsibility for arranging the program. Their enthusiasm has been most encouraging and there is ample evidence that this event will be of outstanding importance in the history and achievements of our Association. The dates are April 19th and 20th. I suggest that all of you make a note on your calendar now to save those two dates for Chicago. It will be well worth your while.



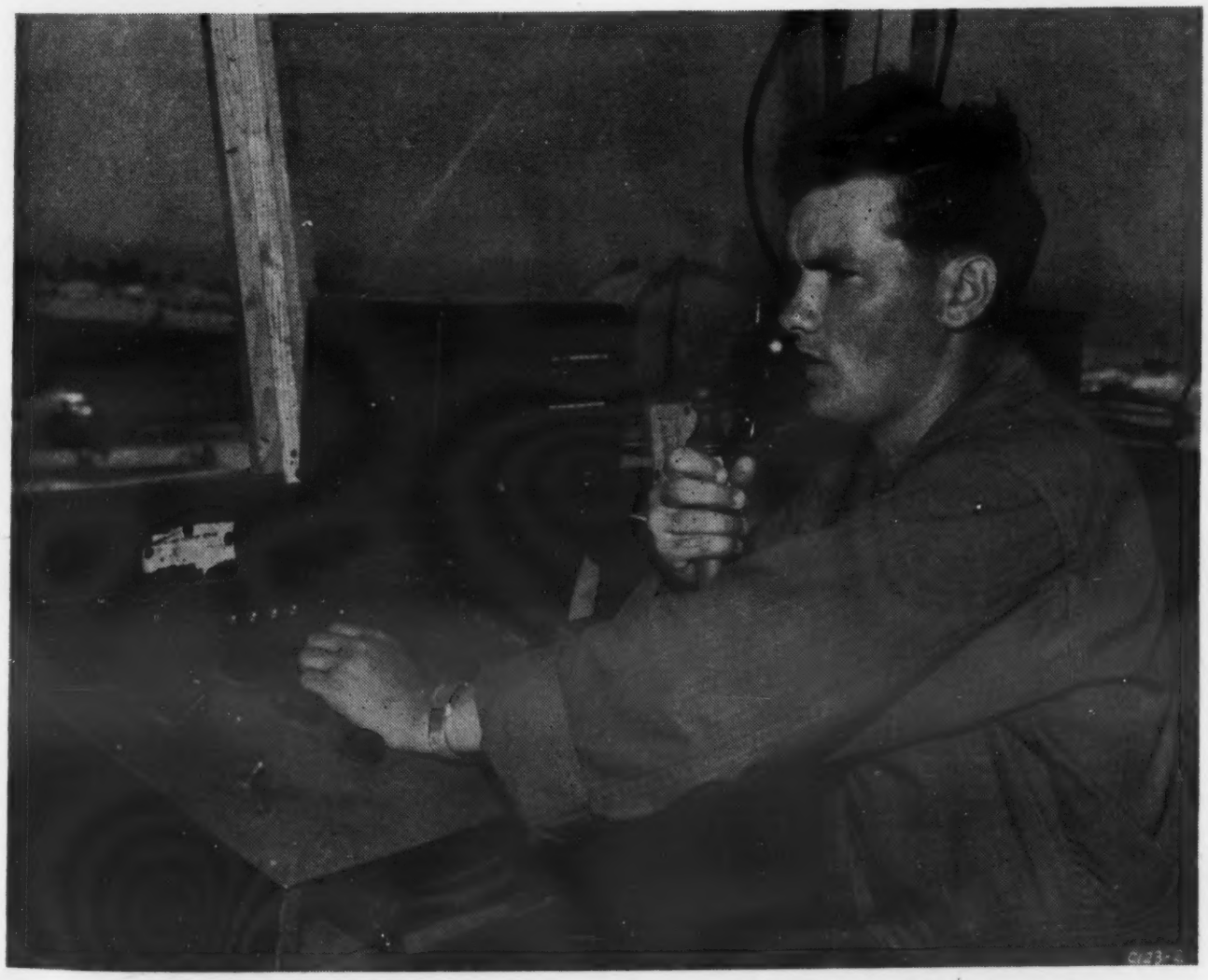
AACS in KOREA

Korea bound group of communications specialists of the AACS are interviewed aboard a C-47 carrying communications equipment to new airstrip.



Lt. Col. Willis S. Johns, CO of an Airways and Air Communications Service group in Japan confers with his detachment commander Capt. James A. Stanford at a recently activated air-strip in Korea.

C-54 being loaded with vital communications equipment for air-lift to newly activated AACS units in Korea.



S/Sgt. James G. Donner of AACS was in radio contact with fighter planes attacking North Koreans just off the edge of this airfield at Pohang-Dong, Korea, when the pic-ture was made. Shortly afterwards Sgt. Donner and other airmen took to foxholes and defended the field against a horde of No-Kos. They were forced to abandon the field the next day. AACS evacuated its GCA by sea in an LST.

KOREA

While buddies spot the effect of artillery barrages, Pfc. Reuland checks with artillery headquarters.

Cpl. Paul G. Hamption, photographer with Photo Division, GHQ, FEC loads his camera somewhere in Korea.

An American soldier maintains radio contact with an artillery observation plane. ➤

AACS

is Still in Europe Too

Since the big air lift "Vittles" ended the operations of the AACS in Europe have not been so widely publicized. But AACS is still there. In fact at the Rhein-Main Air Base, Frankfurt, Germany they have a new building, opened last spring, which was designed and built expressly as a communications center. On this page are shown activities at the new center (see story in Air Force News).

Supervisors, who work in shifts around the clock, check accuracy of operators.

Maj. Richard F. Amann, Wing Communications Officer (seated) confers with staff of 61st Communications Squadron in their completed combined communications building. L-R: Maj. B. L. Harris; Lt. F. A. Zamboli; Maj. Amann; Mr. Robert Geier; Capt. O. Key; Lt. L. G. Henson.

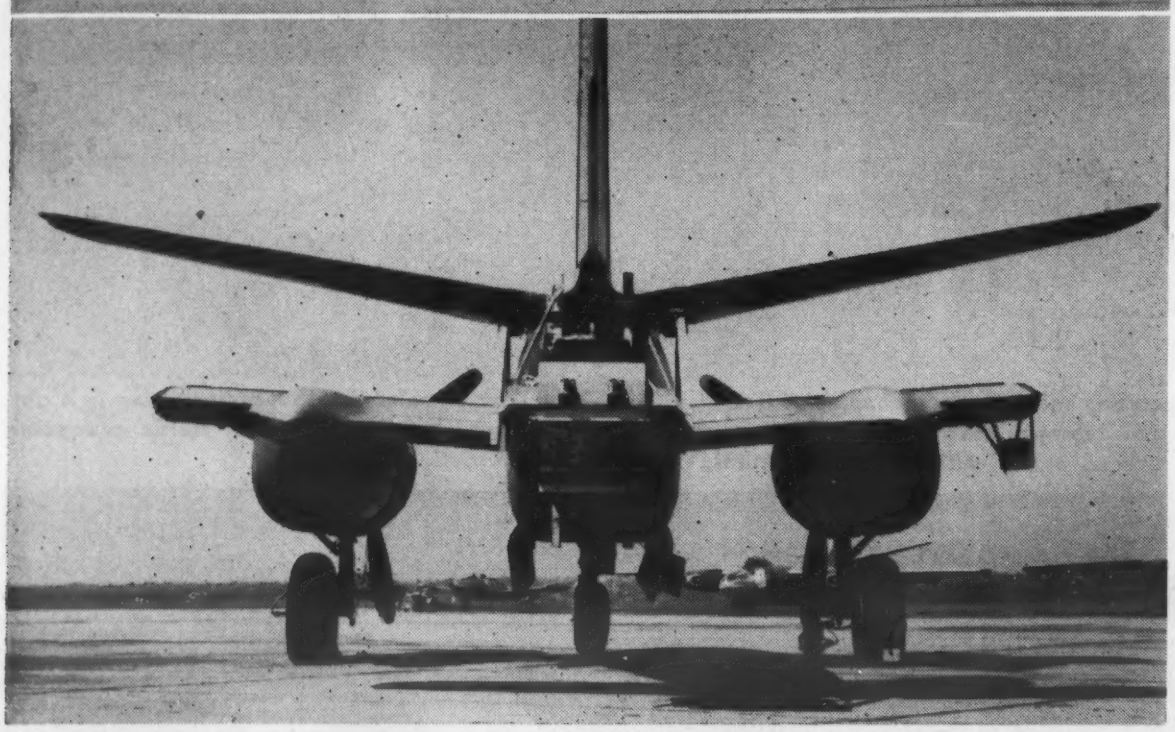
Some of the members of the 1945th AACS squadron check the equipment layout. L-R: Lt. Kenneth Adams; Lt. Col. T. N. Arnett; Capt. R. E. Johnston; Lt. J. J. Peri; Capt. H. T. Pickering.

Moving the switchboard from the terminal building to the new communications building involved re-connecting more than 300,000 separate wires.

Left: 61st Communication Squadron wire chief supervises men as they check out some of the 2100 cable pairs on the main frame. Right: Capt. R. Schultz and T/Sgt. G. C. Scott look over the teletype station. Operators are busy handling operational and weather traffic over semi-automatic equipment.

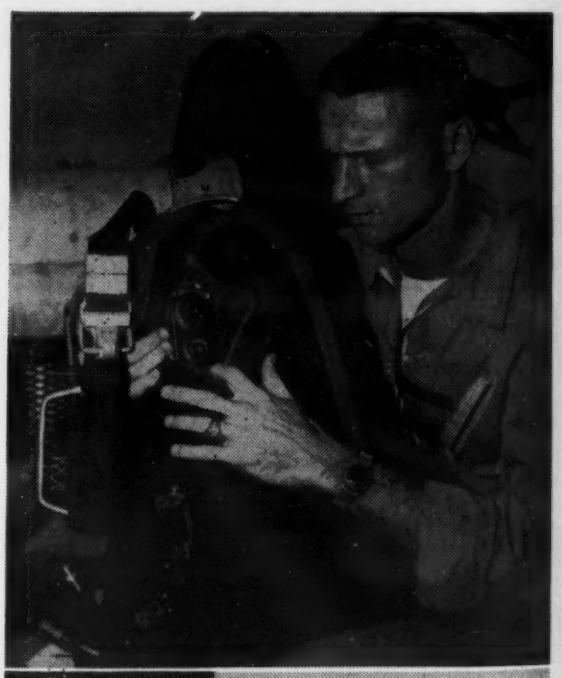
Air Force Research and Development

The C-54 shown at right actually flies with this batch of pipes attached to it — and a like mass of plumbing on the other side. Air Materiel Command engineers at Willow Run Airport (Mich.) have been experimenting with devices to offset aircraft icing dangers. They make flights deliberately inviting icing up, but often old Ma Nature won't oblige, so they accomplish it with the rig pictured here. The maze of pipes contains nozzles which can turn water, from tanks within the plane, into rain, snow, fog, or mist. And the plane flies easier than it would seem at first glance, because the pipes are aerodynamically fitted, slowing down the plane less than 10 miles per hour.



The B-26 above with the clipped wings is performing skid tests at Wright-Patterson AFB. It dashes down the runway pretending it's landing, and from that make-believe comes data needed to design lighter, stronger, smaller landing gear. The clipped wings avoid lift, thus getting as much weight as possible on the wheels. Because it can't lift itself off the ground it's been sympathized with as "the most frustrated airplane in the Air Force."

Below: New automatic opening parachute. Capt. C. G. Whitney, AMC test pilot, sets two tiny dials—a timer and an aneroid element—prior to takeoff. If forced to bail out he need only pull the handle, pointed to below, and the pre-set mechanism will open the chute when he has cleared the plane and fallen to a safe altitude. New release does not interfere with operation of standard ripcord.



a Billion Batteries

President Don Tyrell of Ray-O-Vac looks on while "Doc" Swenson displays the billionth leak proof dry cell.

One day last spring at the Ray-O-Vac Company's main plant in Madison, Wisconsin, the company's oldest employee, Carl "Doc" Swenson, age 84, picked the one billionth Ray-O-Vac Leak Proof battery off the production line and handed it to the firm's president, Don Tyrell. (The company chief executive wasn't on hand accidentally. A ceremony, justifiably, was being made of hitting the billion production mark.)

Both figures—"Doc" Swenson's age, and the battery number—are meaningful in touching on the Ray-O-Vac Company's operation and its history. Take that battery number for instance, and we'll get back to "Doc" later.

A billion batteries is a lot of batteries. Which *is* or may *not* be obvious, depending on the imagination you let loose to work around that figure. If you use the globe-girdling proportion, a comparison much used by Americans ever since their production-line genius began turning out commodities by the millions, you will quickly figure that a billion dry cell batteries, each nearly 3 inches long, if laid end to end could encircle the world one and a half times! Or if you total the wattage output of those billion you might figure out that that total could operate a locomotive between Chicago and San Francisco for 125 trips.

You can be impressed in a number of ways with that billion total, but the Ray-O-Vac Company itself would chiefly like to stress that it adds up to a lot of experience in turning out dry cell batteries. It took some years to produce that number of batteries, and when you keep trying you're bound to learn a lot about your trade in that many years. How many years? Well—let's take a look back at the beginning.

Early Gas Engines Created Big Market

For more than the first half of its existence the Ray-O-Vac Company bore another name. It was first organized by J. B. Ramsay as the French Battery Company. The site was the same as that of the present main plant at Madison, Wisconsin. The year was 1906.

It was an opportune time for the manufacture of dry batteries. The automobile was coming into general use, the public beginning to realize that it *was* going to replace the horse, and those early autos depended on dry battery power in their ignition systems. So did stationary gasoline engines, which were also coming into increasing use.

The new French Battery Company therefore quickly prospered. It had been organized in the month of January and by midsummer of that same year, 1906, additional space was already needed. Construction was begun on a new plant,

Much of the excellence of the Ray-O-Vac "sealed in steel" leak proof flashlight cell begins in the mix room where operators see that high quality, laboratory tested ground manganese dioxide, carbon and other chemical ingredients are mixed into a smooth, even consistency.

Left: Top to bottom: Upper left is the machine which tamps the mix, and adds the carbon pencil. This operation produces "cores," literally the "heart" of the leak proof.

Upper center: The automatic machine measures the exact amount of electrolyte (a liquid paste of corn starch, wheat flour, sal ammoniac, zinc chloride and water) into each zinc can.

Lower center: Zinc cans serve as both a container and one of the poles of the cell. Here small paraffin-treated paper bottoms are put into place in the zinc cans.

Bottom: Taking the cores made by the tamping operation this operator inserts them along with a paper bottom-spacer into previously prepared zinc cans, forcing the liquid paste up along the wall of the can.

and by the latter part of the year it was occupied. From original to new plant all within the space of one year!

The original units lasted only 9 years, however. The historic Madison plant recovered from a fire in 1910, but a second in 1915 virtually wiped it out. The following year construction was started on the first unit of the present factory, and additions at various times have brought the plant to its present proportions.

By the 1920's automobiles had been adapted to the use of the wet battery, but just as the automobile market was dying out for the dry battery manufacturers another was developing. The new radio craze was on putting sets into millions of homes, and as part of them went batteries both wet and dry. However, this market was short-lived, for soon the "plug-in" radio set was developed, using regular house current.

The period following was the most serious for dry battery manufacturers, manifested in the fact that of more than 100 such firms in existence in the early 20's only a dozen still survived in 1928!

Automobiles and radios, however, were not the only devices using dry batteries. The flashlight, which had been a novelty and toy in 1906 when French Battery was first organized, had since become a popular household item. To meet this demand the company in 1929 purchased the Blake Manufacturing Corporation of Springfield, Massachusetts, for the purpose of making flashlight cases. This operation was moved to Clinton, Massachusetts in 1934 and the move tripled facilities for case manufacture.

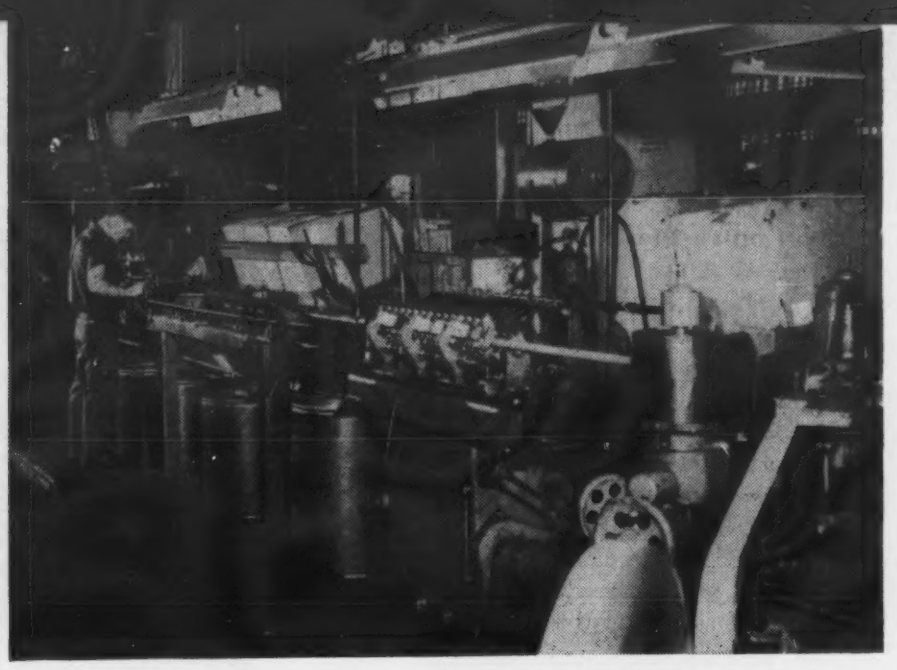
Other important events for the company occurred in 1934. The French Battery Company officially changed its name to Ray-O-Vac, the purpose being to identify the company with its best known trade name. And that year the Lancaster Carbon Company of Lancaster, Ohio, was purchased, providing facilities for supplying Ray-O-Vac's own carbon electrodes for dry batteries. Also in the mid-30's the perfection and resultant popularity of a portable radio had stimulated a new demand for dry batteries, and the company was growing anew!

The Leak Proof Development

Probably the most radical improvement since the invention of the dry cell by Georges Leclanche in 1868 was announced in June 1939—the development by Ray-O-Vac engineer Herman Anthony of the Leak Proof flashlight dry cell. Through use of a special insulation tube and an outer steel covering, which serves as a barrier to any electrolyte, the then new Leak Proof cell eliminated the leaking and swelling which were common with ordinary cells.

Barely had the consumer-public become acquainted with the Ray-O-Vac Leak Proof when the war came and brought with it demands by the Government for the company's entire production of the cell. These cells were used by the armed forces in the Arctic and the tropics, in the deserts and in temperate zones, on land and on sea, and they were found reliable in almost any type of situation.

Assembled cells, still open at the top, are next sealed in this machine which automatically pumps the correct amount of hot asphalt into the top of the cell. This asphalt seal helps prevent loss of moisture and keeps the cell "dry."



Tubes leaving the machine, preparatory to "doming," a process which curls one edge toward the center. The domed end will later insure an air tight leak proof fit when the cell, insulating tube, and lithographed outer shell are assembled one inside the other.

In 1943, with much of the Clinton, Massachusetts flashlight case plant devoted to making parts for rifles and grenades, it was decided to relocate a battery assembly division previously located at that plant. Battery assembly operations were begun in midsummer of that year at Sioux City, Iowa and its production was mostly devoted to civilian battery needs.

War Expansion

More and more dry batteries were needed by the armed forces and to meet the tremendous demands Ray-O-Vac organized the RMR factory in Madison in February of 1944. This was followed in May by the opening of the Signal Battery Company at Milwaukee which employed 5,000 persons, reached peak production of 2 million cells a day, and was reported to have been the world's largest battery plant.

It soon became apparent the company needed more zinc cans for cell containers than could be supplied by outside sources, calling for the establishment of a plant which could help meet that need. The Ray-O-Vac Can Division was opened in Fond du Lac, Wisconsin in July 1944.

In 1945 even greater demands were placed on the company by the Government and early that year the Battery Assembly Company was established in Milwaukee. The War Battery Company of Kansas City, Missouri was the second plant to be organized in 1945 and in July the Battery Chemical Company went into production in Milwaukee. These last three named plants, Signal, and RMR were Government owned though Ray-O-Vac operated, and at the end of the war in August of 1945 they were immediately discontinued. It is estimated that Ray-O-Vac supplied 80% of all dry cell flashlight batteries used by the Army and the Navy during the war.

Returning to a normal peacetime economy it quickly became evident that the company would have to establish increased facilities in order to supply an expanded civilian market. In the spring of 1946 two new plants started production: Ray-O-Vac Limited of Canada located at Winnipeg and the Williamsport Battery Company of Williamsport, Pennsylvania. A third plant, Specialty Battery Company, was established in 1947 at Wonewoc, Wisconsin for the purpose of manufacturing special types of batteries in limited quantities. By 1948 the still increasing civilian demand, both at home and abroad, required the opening of two more plants, one in Paducah, Kentucky and the other in Jackson, Tennessee, increasing the number of manufacturing plants to ten. A general office building acquired in 1946 completes the company's physical plant.

Ray-O-Vac is proud of its Army and Navy "E's" won during the war years. The Madison plant was awarded its "E" in 1943, and by the end of the war it had received four stars. The Blake Manufacturing Company received the 'E" in May 1944 and a star in October, and the RMR Corporation, though organized as late as 1944, was awarded the "E" in 1945.

Employee Factor in Awards

The achievements which earned the company these awards were made possible, the company makes plain, by the understanding cooperation of its employees. And the personnel relations and conditions which led to such cooperation, continuing today stronger than ever, brings us back to Carl "Doc" Swenson and the rest of the employee family.

When you consider that in most of industry, and in government services, the usual retirement age is 60 to 65, you're bound to regard "Doc" as a rarity in industry—an altogether active employee within whispering distance of the century mark! But the fact of "Doc's" four score and four years and his continuous activity in the Ray-O-Vac operation is something of considerable pride to the company, for oldtimers are common to the firm and it is

The trays of cells are guided into a conveyor which takes them partially immersed through thermostatically controlled hot water tanks causing the paste electrolyte to "jell" within the can.

The lithographed LP steel shells, domed insulating tubes, and the zinc cans containing electrolyte and core, are automatically assembled. The cells are now ready for sealing.

proud to have them and their experience still in service. The company credits much of its know-how in battery production to these oldtimers, and feels honored that so many of its employees have been with the company so long, through the good and bad periods the battery industry has enjoyed and suffered in the past 50 years.

At the Madison, Wisconsin plant, the oldest plant, about one-eighth of all the employees have been with the company for more than 25 years. Over half have more than ten years service with the company and this working-together spirit carries over into the other plants of the Ray-O-Vac Corporation.

The person who has been connected with the company for the longest period of time is the founder himself, J. B. Ramsay. While he has ceased direct participation in the company's day to day operations, he is still active on Ray-O-Vac's board of directors and his long experience often proves of value when the board has to make important policy decisions.

In the "Twenty-Five Year Club" there are many who have been with the company actually over 30 years. Among these are Chairman of the Board William W. Cargill and President Don Tyrell. Others can be found in every division of the company.

Madison plant manager, Bill Roper and Ray-O-Vac vice president J. C. Ryan continue to explore new ways and means for improving production techniques.

"Doc" Recalls Early Days

In the production division "Doc" Swenson has the longest continuous service record with the company. "Doc" came to work for the company 34 years ago in 1916. He first worked for the contractor who built the Madison plant, and thereafter he stayed with the company.

Relating some of the things he remembers about the growth of the company, "Doc" declared, "The first year, before the south wing was built, we had so much room in the main building that the express wagons, each with two horses, used to drive right into the main building to load up. Now all that space is filled with people and production lines." "Doc" still works every day as foreman of the stockroom. He and his daughter who works at the main office are the only father-and-daughter, first and second generation combination, in the twenty-five year club.

When "Doc" picked the one billionth Leak Proof cell off the production line on April 26, 1950, there were nearly 1,000 employees and 75 distinguished guests gathered at the plant to commemorate that outstanding event in the company's history. Among the guests were included Wisconsin's Governor Oscar Rennebohm, Army and Navy officers, representatives of Wisconsin and national industry, and Madison civic officials. Colonel Eugene V. Elder, Signal Corps, represented the Army, Captain C. J. Biederman, USN, the Navy, and Dr. G. Q. Vinal, chief of the electro-chemical division, the National Bureau of Standards.

President Tyrell, in his address to the assembled employees and guests pointed up facts which conveyed the enormity of a billion cells. Among these he emphasized the human factor. "Six million man hours of labor," he stressed, "were used, and practically all of it within this plant. I congratulate all of our people in all departments for the contribution each has made toward this achievement. It is an accomplishment of cooperation—of teamwork—with every department and every division playing their part."

With an eye to the second billion mark, President Tyrell says, "I want to emphasize that we are not stopping here. We are following through and are working on other machines and new types of batteries. We believe that employees, consumers, and the company all benefit as we are able to mechanize our plants and produce better batteries more efficiently."

Chairman of the board William W. Cargill addresses the audience gathered to celebrate the production of Ray-O-Vac's billionth battery.

ELECTRONIC ACCOUNTING for BUSINESS

Many of the countless inventions, techniques and processes which were developed by American scientists under the stimulus of World War II still are shrouded in the cloak of official secrecy. Of those which have been revealed, most have little non-military value and only a few have been adapted to the needs of peacetime business and industry.

One of these, in which wartime science made some of its most spectacular advances, has now come to the aid of business accounting under the name of Univac. Recently introduced by Remington Rand, Inc., Univac is the invention of Dr. John W. Mauchly and J. Prosper Eckert, Jr., the same men who developed Eniac, the world famous "electronic brain," for United States Army Ordnance. Faster and far more versatile than Eniac, Univac performs calculations in split micro-seconds and completes complicated accounting procedures with super-human speed and accuracy.

Actually, the name Univac applies to the principal unit of a fully integrated series of related machines. In this series there are machines to prepare data for processing; machines to pass the information into the Univac; the computing mechanism itself; a control unit to follow or change operations in the Univac; and machines to record and transcribe the results of the computer's work.

Disregarding the advanced electrophysical principles involved, the operation of Univac is comparatively simple. A typist punches out on the keyboard of a typewriter-like machine, known as the Unityper, all necessary data and instructions, in either letters or figures. These are recorded on magnetic tape in the form of pre-determined patterns of dots.

More than a million digits — the equivalent of approximately 11,000 punched cards — can be stored on a single reel of this tape, which can be erased at any time and re-used for new data, or stored indefinitely. The ability of the Univac to handle both alphabetical and numerical data adds greatly to the flexibility of the system.

10,000 Characters a Second

As the recorded information is fed into the Univac at speed of more than 10,000 characters a second, the computer executes, at electronic speed, the instructions it has received and records the results on magnetic tape. These will later be transcribed onto paper. At the same time, it checks its own answers at every step, not only for accuracy of figures but of names as well. To feed information into the computer from the magnetized tapes and to record the results of its operations, a machine known as the Uniservo is used. To read and transcribe the results, a Unityper is needed.

In actual operation, a number of Unitypers and Uniservos are used to feed problems into the Univac and another battery of Uniservos and Uniprinters would be hooked up to take off the results and transcribe them.

One or two of each would never be enough to keep the computer, with its lightning-fast operations, busy for any length of time.

Brain of the system is the Univac which consists of three major components: the memory which stores data, instructions and results; the mathematical unit which performs the actual computations; the control unit which instructs the machine what to do and when to do it.

The "mercury memory," the most amazing of Univac's accomplishments, is an acoustical device which can retain up to 1000 registered "memories" at one time. It holds not only all the data undergoing computation, but the instructions concerning the computation, as well. Blocks of information read from the tape into the Univac are stored in the memory and held in readiness for any mathematical or logistical operations to be performed upon them.

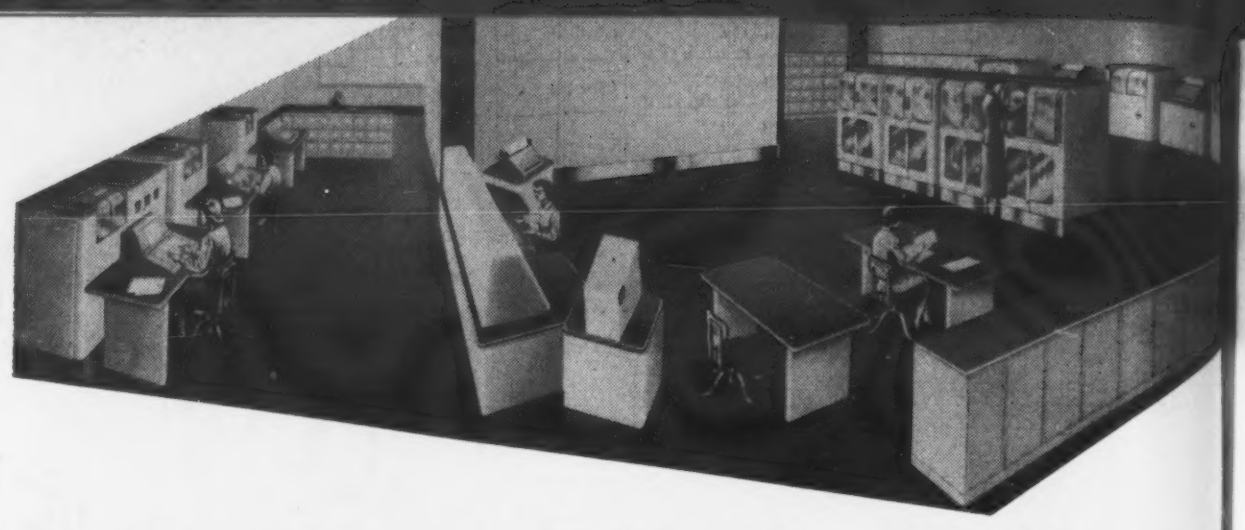
There is no mathematical problem which the Univac cannot solve. It adds, subtracts, multiplies and divides at incredible rates of speed. It takes square cube roots, it sorts, collates and remembers. Addition or subtraction, for example, is performed at the rate of 1900 per second (that's 6,840,000 an hour); multiplication at 465 per second (1,674,000 per hour); division at 255 per second (a mere 918,000 an hour).

In some respects, the Univac seems almost capable of independent thought. For example, it automatically checks each computation and its accompanying instructions for impossible combinations — actually proofreading the copy given it by human beings.

Since the Univac uses the alphabet, as well as numerals, it gives clearcut evidence of what is going on at each stage of the computation. When it reaches a number that is too great for it to handle, the Uniprinter taps out,

"Exponent over limits. Stop." If, through human errors, an incorrect tape is put on the Uniservo, the machine writes, "Wrong Tape," and no calculations are made.

The Univac has almost endless potential business uses, including payroll computations with their many work-rate calculations, withholding tax and other deductions; intricate insurance accounting with its many actuarial problems; public utility billing with varying rate structures and meter reading; management controls of inventory, production, sales, personnel, and many others.



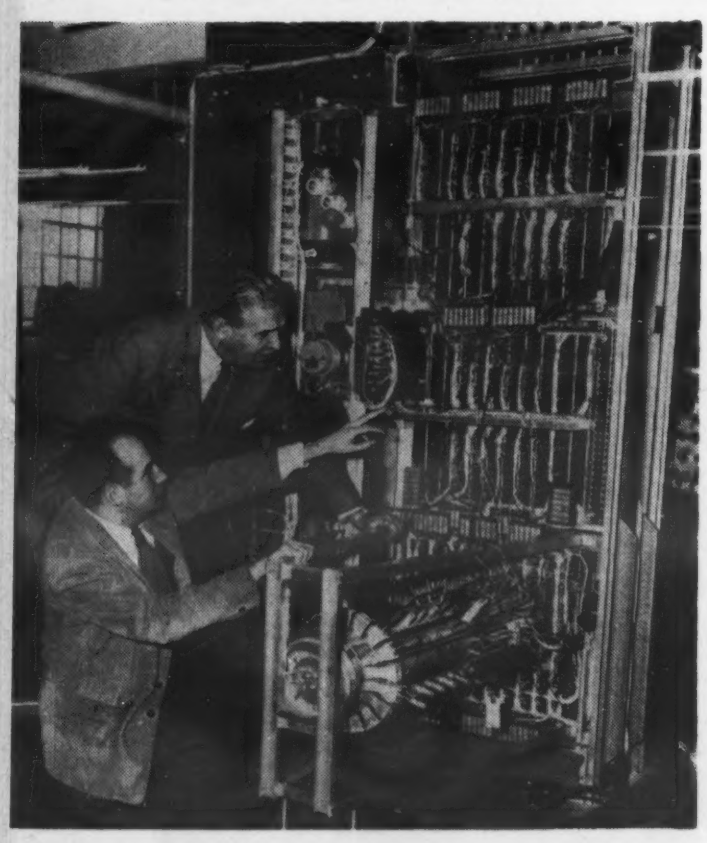
Right: A Univac installation as it may appear in the near future. Unitypers, Uniservos and Uniprinters are arranged in orderly groups about the central unit — the Univac itself.

Speeds Payroll Procedures

For a simplified example of business accounting on the Univac, here is a payroll procedure which involves deducting the 1½% Social Security Tax. At this writing, this tax is effective only on the first $3000 of each individual's pay during a single year. It is known that some employees have already accumulated pay in excess of this sum; that others will slightly exceed it on the current payment; that still others will fall below.

The Univac has already computed the gross pay for the week of the first employee and has placed this figure in the memory. His cumulative gross pay for the year, through the last pay period, is also stored. In still another location, the sum $3000 is stored for repetitive use.

In the first operation, the Univac subtracts from $3000 his gross pay for the year. If the result is negative, that is, if he has already earned over that amount, he is not subject to the tax so the control proceeds to the next operation (possibly the withholding tax). If the figure obtained is positive, it is compared with his gross pay for the current week. If this result is larger, the tax is calculated on the gross; if smaller, the tax is calculated on the difference.



For instance, $3000 Total Wages Subject to Tax, less $2990 Earned Through Last Pay Period equals $10 (which is less than the Earnings This Period, $60). Therefore, $10 × $.015 = $.15 Social Security Tax Deduction This Period. This operation, and all others involved, are repeated for each employee at speeds that are fantastic by ordinary standards.

In this manner, Univac can perform in one tape-pass operations which would require a number of successive runs through other types of office equipment. In addition, several groups or kinds of sources data can be fed into the computer simultaneously, combined and used to produce a single consolidated result.

Toward the Ultimate

Believed to represent the greatest single stride ever made toward the ultimate computer — a universally flexible, super-speed non-mechanical, integrated unit capable of handling large masses of source data or complex mechanical formula with equal facility — Univac has a long and distinguished ancestry, dating from the very dawn of civilization.

Since earliest times, the need for some device external to the mind of man to assist him in carrying out simple arithmetic has been recognized. The first mechanical aid to human reasoning was the human hand, and it is not by accident that our numeric system is based upon multiples of one and ten. Counting by piles of pebbles — a method used by the ancients — is reflected in the word calculus which, in Latin, meant pebble, or stone.

Left: Prof. J. Presper Eckert (left), one of the inventors of the Univac, explains the assembly to Lt. Gen. Leslie R. Groves, vice pres., and director of Remington Rand's laboratory for advanced research.

These are the simplest examples of reasoning by mechanical analogy, the system currently employed in certain types of computing devices. Another primitive method, the abacus, is still in use in the Orient today. Crude though it is, the abacus represented a great forward stride in the world's thinking.

Pascal (1623-1662) invented one of the earliest adding machines on record and another mathematician, Leibnitz, (1646-1716) is credited with having built one of the first machines capable of performing the four operations of arithmetic.

The complexity of problems arising in business and the physical sciences has made specialized devices essential. The introduction of the punched-card type of calculating machine has a tremendous influence upon business and financial procedures. If it were still necessary to rely upon longhand methods, modern business operations would be practically impossible, and science would still be in its primitive stage. Just as higher mathematical systems had to be invented to deal with theories which could no longer be handled by ordinary arithmetic, so devices to make these theories of practical value had to be designed.

The first suggestion for a large-scale continuous variable machine now called a differential analyzer — was made by the great English physicist, Lord Kelvin, in 1876. The first really successful differential analyzer was designed and built in this country in 1925 by Dr. Vannevar Bush, then professor of electrical engineering at Massachusetts Institute of Technology, and later wartime head of the Office of Scientific Research and Development for the U. S. Government.

War Increased Speed Need

During the war, it became increasingly evident that differential analyzers and other existing computers had shortcomings which made it impossible to keep pace with new physical discoveries. The limitations of existing devices indicated that high-speed digital calculators were needed, capable of handling all types of computing problems.

The original idea for the forerunner of Univac, the Eniac (electronic numerical integrator and computer), was conceived in 1941 by Dr. John W. Mauchly and J. Presper Eckert, Jr., then associates at the University of Pennsylvania's Moore School of Electrical Engineering. The following year, the ballistics laboratory of the Army Ordnance Department entered the pic-

(*Continued on page* 61, *col.* 3)

the BELL SYSTEM *in peace and war*

By C. O. Bickelhaupt

Service to the Nation in Peace and War

So reads an inscription in the lobby of the American Telephone and Telegraph Company at New York.

Perhaps nothing else so aptly describes the role of the companies of the Bell Telephone System in the transmission of intelligence from one place to another.

In peace, the companies link Americans with the far corners of the earth. Over the Bell System's telephone network are carried some 140,000,000 two-way conversations every day.

In war the companies provide a large portion of communications equipment and contribute many of the trained personnel vital to victory. In addition, they furnish communication services without which the home front could not adequately support the fighting front.

The Bell System's primary undertaking is telephone service, both local and long-distance. For this purpose, it has installed 34,600,000 telephone instruments, maintains 135,000,000 miles of wire circuits, and operates more than 8,000 exchange central offices.

Total assets of the Bell System are more than 11 billion dollars. It is owned by nearly a million stockholders —people from all walks of life in every state of the union—a true democracy of ownership.

Local and intra-state communication services are the responsibility of the Associated Bell Telephone Companies, of which there are 20 in the System.

In addition to the Bell Companies, there are about 5,600 other U. S. telephone companies whose 7,400,000 telephones connect with those of the Bell System.

AT&T, parent company of the Bell System, operates interstate long-distance circuits through its Long Lines department which interconnects the toll networks of the operating companies. It also provides centralized financing for the Bell companies, maintains a general staff of experts in the various fields of telephony, and—jointly with the Western Electric Company—operates the Bell Telephone Laboratories.

Western Electric has been part of the Bell System since 1882 and manufactures or supplies the bulk of equipment for the Bell System operating telephone companies.

The Bell Laboratories—the world's largest industrial laboratory — carries

The Bell System's Transoceanic-radio at 32 Sixth Avenue, New York.

C. O. B.

Carroll Owen Bickelhaupt, vice president and secretary of the American Telephone and Telegraph Company and of the AFCA, and a wartime brigadier general in the Signal Corps, has been a telephone man ever since he began working—and that was during his high school vacation periods with the Dakota Central Telephone Company in Aberdeen, South Dakota, "COB's" home state.

The Bickelhaupt story is the success story common to America, but always interesting. The young man—messenger, repairman, junior engineer, toll rate engineer, toll traffic engineer, commercial engineer—and on until a vice president of one of the member companies, and then a vice president and secretary of the parent company.

General Bickelhaupt began his military career as a lieutenant in the Signal Corps in World War I, winding up that war as a major. In postwar reserve activity he advanced to the rank of colonel by 1937.

In 1941 he was ordered to active duty and assigned to the U. S. Embassy in London as a military observer. From December he served for a year and a half in the OCSigO, and from there for a year as C.O. of the Eastern Signal Corps Training Center at Fort Monmouth. In the rank of brigadier general he returned to Europe as director of communications division, OCSigO, and director general, signal communication service, ETOUSA, until the end of the European war when he was made director of communications, U. S. Group Control Council (Germany). He returned to the U. S. in August and to reserve status in November of 1945. In recognition of his outstanding service during the war years he received numerous decorations from the U. S. and from foreign governments.

Gen. Bickelhaupt is a vice president and director of the AFCA and a director and past president of the New York Chapter. He is a Fellow in the A.I.E.E. and is active in several other engineering societies. He holds the Diploma of the Medal of the Association of Engineer-Doctors of France for 1947.

Gen. Bickelhaupt has authored several articles on telephone toll rate matters and military communications.

Left: In the control center along the television networks, Bell System technicians check the picture and sound quality on monitoring equipment.

on fundamental research in all phases of communications.

In addition to regular, land-line telephone service, the Bell System provides many other communication services.

Overseas telephone service was opened between this country and England in 1927. Since then service has been extended to both hemispheres and it is possible to reach nearly 96 per cent of the world's telephones in 87 countries and territories. Today, overseas messages are being handled at the rate of 625,000 a year.

Though few realize it, network radio and television programs are sent over telephone channels from their points of origin to the stations which broadcast them locally. At present, Long Lines operates more than 180,000 miles of program transmission circuits for the linking of radio and television stations.

Operating telephone companies also furnish program transmission circuits within their own territories, from studios to transmitters and for local or regional networks.

Television Pioneers

The System pioneered in sending television images from one place to another, both by wire and by very-high-frequency radio. It has linked 42 major cities along the east coast and in the middle west for the simultaneous broadcasting of television programs.

The Bell System's experience in furnishing radio broadcasting networks, which dates back to June 1923, has been invaluable in helping it to prepare for the problems of providing circuits for transmitting television programs.

Facilities which will make possible nation-wide television network broadcasting are being provided rapidly. The Federal Communications Commission only recently has given final approval for the construction of 35 radio relay stations between Denver and San Francisco. This clears the way for completion of the last leg of the coast-to-coast hookup which can carry TV. Service is expected to start late in 1951 or early in 1952. All together, there will be 107 relay stations on the route.

Teletypewriter service, furnished by Long Lines and the operating companies, is a means of transmitting typewritten messages between offices, whether in the same building or on opposite sides of the continent.

Teletypewriter exchange service permits the inter-connection through switchboards of any subscriber's machine with any one of 26,000 others making up the nationwide system.

Long Lines and the associated telephone companies also provide two million miles of private-line circuits for such services as telephone, teletypewriter, wire photo, and Morse telegraph.

Private-line networks for the Government, which total nearly 500,000 miles, include one teletypewriter system more than 125,000 miles in length.

Over networks more than half a million miles in length, the press sends a stream of news and pictures by private wire. Words are transmitted and received by teletypewriters, and pictures by machines which convert light waves into electrical waves and back again much as a telephone converts sound waves into electrical impulses.

Mobile Radiotelephone

One of the outstanding advances in telephony since the war has been the inauguration of mobile radiotelephone service to automobiles, trucks, trains, etc. There are more than 8,000 subscribers now using the service in all large cities. Only a lack of radio frequencies prevents the installation of mobile service to thousands of applicants now waiting.

Telephone service between regular subscribers on shore and ships at sea is another of the Bell System's unique communications services. Many large passenger liners are equipped with ship-shore telephone service.

Time and again, the unified service provided by the Bell System has proved to be a national asset of incalculable importance.

Emergency Service

After hurricanes, floods, ice storms, earthquakes, and fire, the men and women who build and operate the telephone plant go "all out" to furnish emergency service and restore damaged plant. At the same time, Western Electric swings into action to deliver the needed equipment and supplies from its stocks in 28 distributing houses from coast to coast.

It is with such experience behind it that the System met the challenge of war. The research facilities of Bell Laboratories and the huge productive capacity of Western Electric always are ready to serve the public need in any national emergency.

Throughout World War II, the resources of the Bell System and Western Electric were devoted to the needs of the United States and its allies. The results of their development-engineering-manufacturing teamwork contributed greatly to the efficiency and volume of Army and Navy electronics and communications equipment.

Western Electric was one of the nation's largest producers of such ap-

Growing quartz at Bell labs to replace scarce and indispensable natural quartz.

paratus, including various types of radio equipment, sonar, and radar. In the field of radar alone, Western supplied the government with more than half its requirements.

A Factor in Other Research

Telephone research also played a key part in radar development and in such projects as gun directors, rockets, torpedoes, guided aerial missiles, anti-submarine devices, airplane crew trainers and magnetic mines.

During the war, nearly 70,000 Bell System employees entered the armed forces. The experience and training of telephone people was invaluable to the communications services. Experienced telephone men formed a nucleus of specialists in a large number of Signal Corps units. Others conducted training courses for military communications personnel. Bell engineers, while still in a civilian status, went to battlefronts around the world to look after intricate electronics equipment.

Last year, Western Electric and the Bell Laboratories were asked by the Atomic Energy Commission to take over operation of the Sandia Laboratory at Albuquerque, New Mexico. The new operators of the laboratory will have an important function in bridging the gap between development work and the manufacturing operations on atomic weapons.

Air Warning System Set Up

Characteristic of the ability of the telephone industry to fulfill military needs is the recent installation of an Air Force air-raid warning network.

The Air Force wanted to organize a large corps of plane spotters for immediate defense of the nation's vital industrial centers. The entire system required fast, reliable communications linking radar stations, control centers, and civilian ground observers.

Within a few months, the telephone industry has developed, manufactured, and installed all the special equipment required. An elaborate system of private and commercial facilities enable reports of approaching enemy aircraft to be forwarded and evaluated and warnings sent out in a few minutes.

The search never ends for ways to increase the efficiency of communication apparatus and to widen the usefulness of service to the public.

This search began in the attic room on Court Street in Boston where Alexander Graham Bell carried on his first successful experiments with the "electric speaking telephone."

From this tiny beginning has evolved the Bell Telephone Laboratories of today. Nearly 6,000 scientists, engineers, technicians and others at the Bell Labs continuously search for new devices, new tools, and new techniques.

Right: Long-distance ... On the pathway of a circuit. ... CLR switchboard where the operator takes the details of a telephone call from the subscriber making the call, obtains the proper route and makes the connection with the called person.

Types of Lab Activities

The work of the Bell Laboratories is of four broad types:

(1) Fundamental research, not only in electricity but also in mathematics, physics, metallurgy, chemistry, and other sciences.

(2) Apparatus development, including the design and proper functioning of individual mechanisms in the telephone plant.

(3) Switching development, which is the joining of wires and apparatus into complete systems so that telephone connections can be made quickly, accurately, and economically.

(4) Transmission development, or the improvement of talking quality so that people can hear each other regardless of distance.

Obviously, each of these functions merges into all of the others, and cooperation among these departments and between the Laboratories, telephone companies, and Western Electric must be extremely close.

No achievement of the Bell Laboratories has had more far-reaching effects than its work in the development of the electronic vacuum tube.

Telephone scientists first made of DeForrest's simple audion an amplifier which, placed at intervals in long distance lines, restored the energy of weakening voice currents and made it possible to telephone from coast to coast. They used it to create and control the high-frequency oscillations on which radiotelephony is based.

Next, vacuum tubes were employed to transmit these high-frequency cur-

(*Continued on page 60, col. 1*)

Young lady below uses new radio-mobile-urban auto-telephone.

ANALOG COMPUTERS AND PLOTTING DEVICES

EAI Model 205 Variplotter—modern plotting device.

By Charles M. Schedlbauer and Davis H. Corkran

During World War II the presence of fast-moving air targets made necessary the development of improved tracking and plotting devices. The manual plot became passé, and means had to be devised whereby a reliable plot of the action of a target could be made accurately and quickly. It is the purpose of this article to point out the development of automatic plotting devices in the language of the layman.

Very briefly, the developmental history followed a course of singular advance. From full manual plotting, the first step was the use of a scale which rotated about a point in agreement with the position of the radar antenna. This required a plotter to mark the range along the scale with a writing instrument. The next step was to indicate the range by a spot of light moving along the scale. However, this did not alleviate the need of a plotter and his writing instrument. Since radar sets were tracking automatically, it seemed logical to believe that the plotting could also be done automatically.

The radar set provides, continuously, certain information that indicates the present position of the target, i.e.:

(1) Distance from the radar to the target
(2) The bearing or azimuth of the target from a known reference
(3) The height of the target.

Since radar observations are made in spherical coordinates, the above information as received from the radar is:

(1) Slant range
(2) Azimuth angle
(3) Elevation angle.

These coordinates define the position of a point in space, as shown in Figure 1 on the next page, upper right.

For purposes of plotting, it is desirable to know the path of the target over the ground. To obtain such information, it is necessary to know:

(1) East-west component of the ground range of the target
(2) North-south component of the ground range of the target
(3) Vertical height of the target above the ground.

It now becomes necessary to convert the spherical information, as obtained from the radar, into the rectangular coordinates that are required for a ground plot. Referring to Figure 2, point O is the observer or radar set. The north-south, east-west, and vertical line Z are shown intersecting in point O. Point P represents a target. The information supplied mechanically as angular shaft position by the radar is:

(1) D—The slant range OP
(2) A—The azimuth angle measured in mils from north
(3) E—The vertical angle of elevation measured in mils from a horizontal plane through O.

Point G is the projection of point P in the horizontal plane. From triangle OGP the vertical height H and the ground range R may be determined, since the slant range D and vertical elevation angle E are known.

$$PG = H = D \sin E \qquad (1)$$

$$OG = R = D \cos E \qquad (2)$$

Solving equation (2) for R, it is then possible to obtain the X and Y compo-

The authors: Mr. Schedlbauer is director of sales, and Mr. Corkran technical representative of Electronic Associates, Inc., Long Branch, N. J.

nents of R, since the azimuth angle A is known.

$$X = R \sin A \quad (3)$$
$$Y = R \cos A \quad (4)$$

X, Y, and H have now been determined mathematically, and it remains only to obtain these expressions electrically and transform the electrical data into the mechanical process of plotting.

Potentiometer Use

The observed data, which are represented by the angular position of three shafts, must be put into electrical form. To accomplish this, the potentiometer is used. The potentiometer is arranged in the arc of a circle with a shaft at the center of the circle. The shaft carries a contact brush, which travels along the potentiometer as the shaft is turned. It is beyond the scope of this article to enter into the complexities of potentiometers, but suffice it to say that the potentiometers can be manufacured so that the contour or taper of the potentiometer is such that the output voltage from the potentiometer brush follows a predetermined scale. The scale may be linear, logarithmic, or trigonometric. For example, suppose a voltage which is proportion to the sine of the angular displacement of the shaft from 0° to 90° is required. Reference to the trigonometric tables shows that the sine function increases from 0 to 1 respectively as the angle is increased from 0° to 90°, and that the increase is at first rapid and diminishes as 90° is approached. Expressed in percent, 1.745% of the total resistance of the potentiometer must be included in the first degree of rotation, 1.245% in the 45th degree, and 0.015% in the 90th degree.

For full 360° rotation, four such cards are put together. By adding another contact brush exactly 90° in advance of the sine contact brush, the cosine function can be obtained from the same potentiometer since $\cos \theta = \sin (90° + \theta)$. By placing two more brushes opposite these, voltages proportional to the negative sine and cosine functions can be obtained.

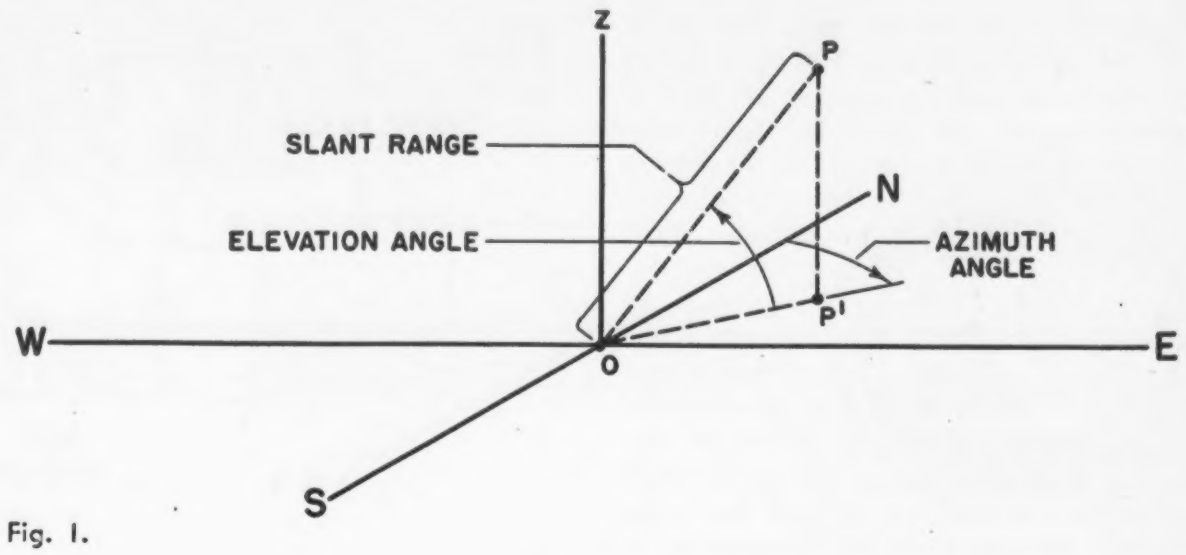


Fig. 1.

Amplifier & Servo Systems

The voltage obtained from the contact brushes is equal to the applied voltage multiplied by the function of the position angle of the shaft. Now, if the voltage which is proportional to the ground range R and its negative copy are applied to one of the sine-cosine potentiometers whose shaft rotates in accordance with the radar azimuth, the brush potentials will be:

(3) R sin A
(4) R cos A

These expressions are recognized as those for X, the east-west component (3); and Y, the north-south component (4), of the horizontal range. It remains, now, to devise a system whereby use can be made of the X, Y, and H voltages to provide a plot or graphic presentation of the activity of the target projected on the ground plane.

The two most important components of the computer-plotting mechanism are the d-c amplifier and the servo system. Since the theory of operation of both of these components is generally understood, detailed discussion will not be given. However, the rudiments of the theory necessary to point out how these components are applied to the plotting board will be reviewed briefly.

The d-c amplifier is an electronic device which produces a d-c output voltage proportional to its d-c input voltage. In other words, when the input voltage to a d-c amplifier is changed by a given amount and kept constant at this new value, the output voltage will also change in accordance with a predetermined ratio and remain stationary at its new value. These amplifiers are used in conjunction with various input networks to perform one or more of the following operations:

(1) Reverse the polarity of a voltage
(2) Isolate or buffer one circuit element from another
(3) Add or subtract d-c voltages (sum algebraically)
(4) Multiply, divide, or weigh any of the input voltages by any desired fixed factor
(5) Produce a voltage which changes at a uniform rate.

Typical features of a d-c amplifier are:
Net voltage amplification—250,000 to 350,000
Effective input impedance—Approx. 1 ohm
Effective output impedance—Less than .04 ohm.

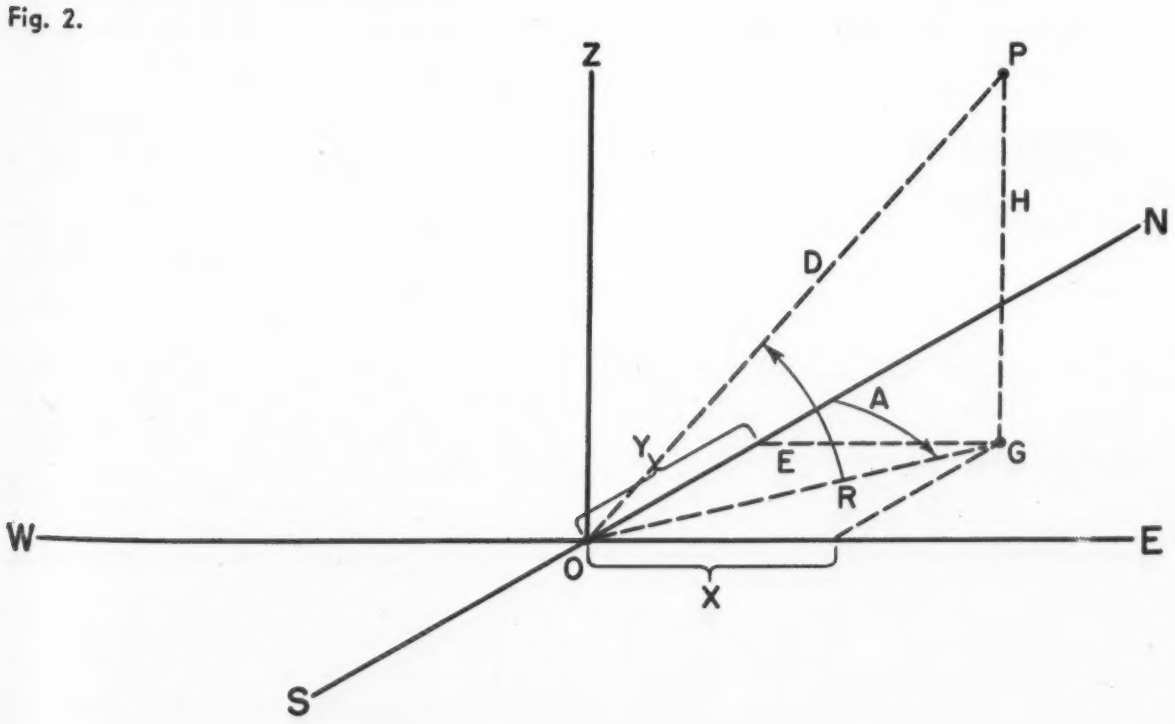
Versatility

The versatility of such a device is immediately apparent, and the number of ways in which the signals can be used in conjunction with d-c amplifiers is almost unlimited.

The servo systems are broken down into two classes—d-c servo systems and a-c servo systems. Basically both systems are the same, except that one accepts d-c input signals while the other accepts a-c input signals.

In this discussion, the d-c servo system will be used as an example to point out the method of operation. The d-c servo system is one in which the signal supplied is in the form of a d-c voltage, and the plotting pen, plotting arm, shaft, or some other object is positioned by means of mechanical coupling to a potentiometer whose d-c output voltage is made to balance that of the applied d-c signal. Such a system is illustrated in Figure 3. A d-c signal representing some quantity, for example R, is

Fig. 2.



applied to one of the input terminals of the servo amplifier. The other input is obtained from the contact brush of a potentiometer. If these two input voltages are equal, there will be no output from the amplifier, the two-phase motor will not turn, and the potentiometer will remain fixed. If, however, the d-c signal voltage is greater than that of the potentiometer brush, the servo amplifier will deliver an a-c voltage to the two-phase motor. The phase of this voltage will be such as to cause the motor to rotate the potentiometer until a balance is obtained between the input signal voltage and the potentiometer brush voltage. By a suitable coupling to the motor, a displacement that is proportional to the d-c signal voltage may be had. The basic plotting board contains two such systems. One positions the arm in accordance with the X signal and the other positions the pen, which travels along the arm in accordance with the Y signal. The combination of these two motions causes the pen to draw a ground plot of the target.

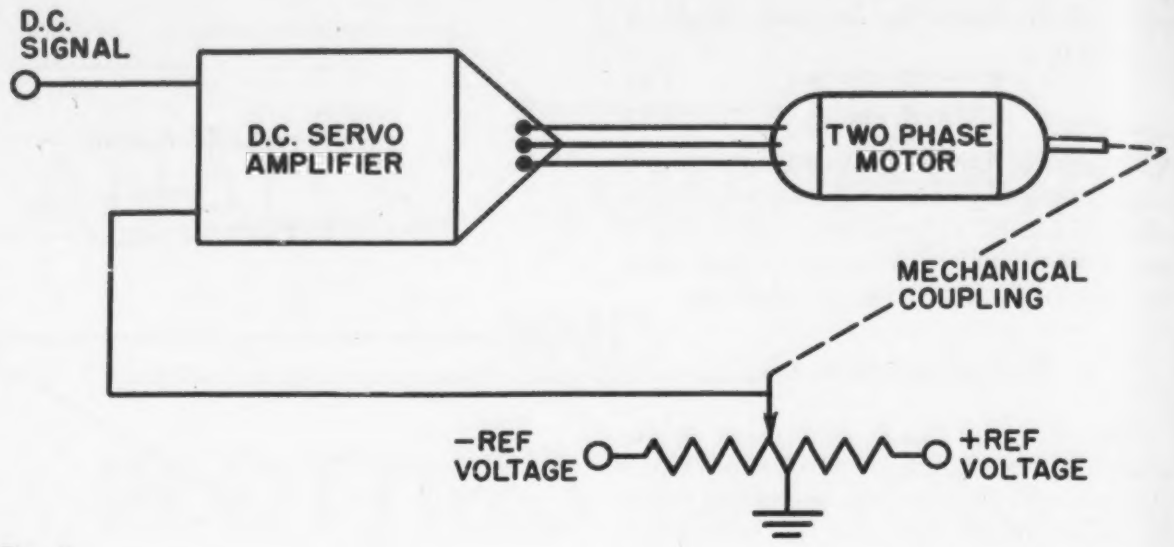


Fig. 3.

Thus far the discussion has pointed out the fundamental requirements of a plotting system; i.e., (1) method of obtaining signals, (2) method of diversified use of the signals, and (3) method of plotting or recording information. Let us now build these three "methods" into a basic plotting device.

Figure 4 shows schematically the basic plotting board. Here we see the range, azimuth, and elevation potentiometers; the isolating or sign-reversal d-c amplifiers; the input d-c amplifiers; and the servo systems. This basic board would provide us with a "ground plot." The H signal could be applied to a similar servo system to provide an altitude plot.

It must be emphasized that the system, as diagramed in Figure 4, is very basic. Refinements, which make the instrument more versatile, necessarily add to the complexity of the device. Some of these refinements are listed below with a brief description of the functions of each:

(1) Variable Scale Factor — This enables the operator to plot to a predetermined scale or to a scale which may be manually adjusted to match special non-standard scales.

(2) Parallax—This allows the position of the radar set, with respect to the plotting surface, to be shifted to enable a plot to be made which would normally fall outside the limits of the plotting surface.

(3) Data Smoothing—This is employed to give a smooth plot by "ironing out" the jitters in the signals received from the radar set.

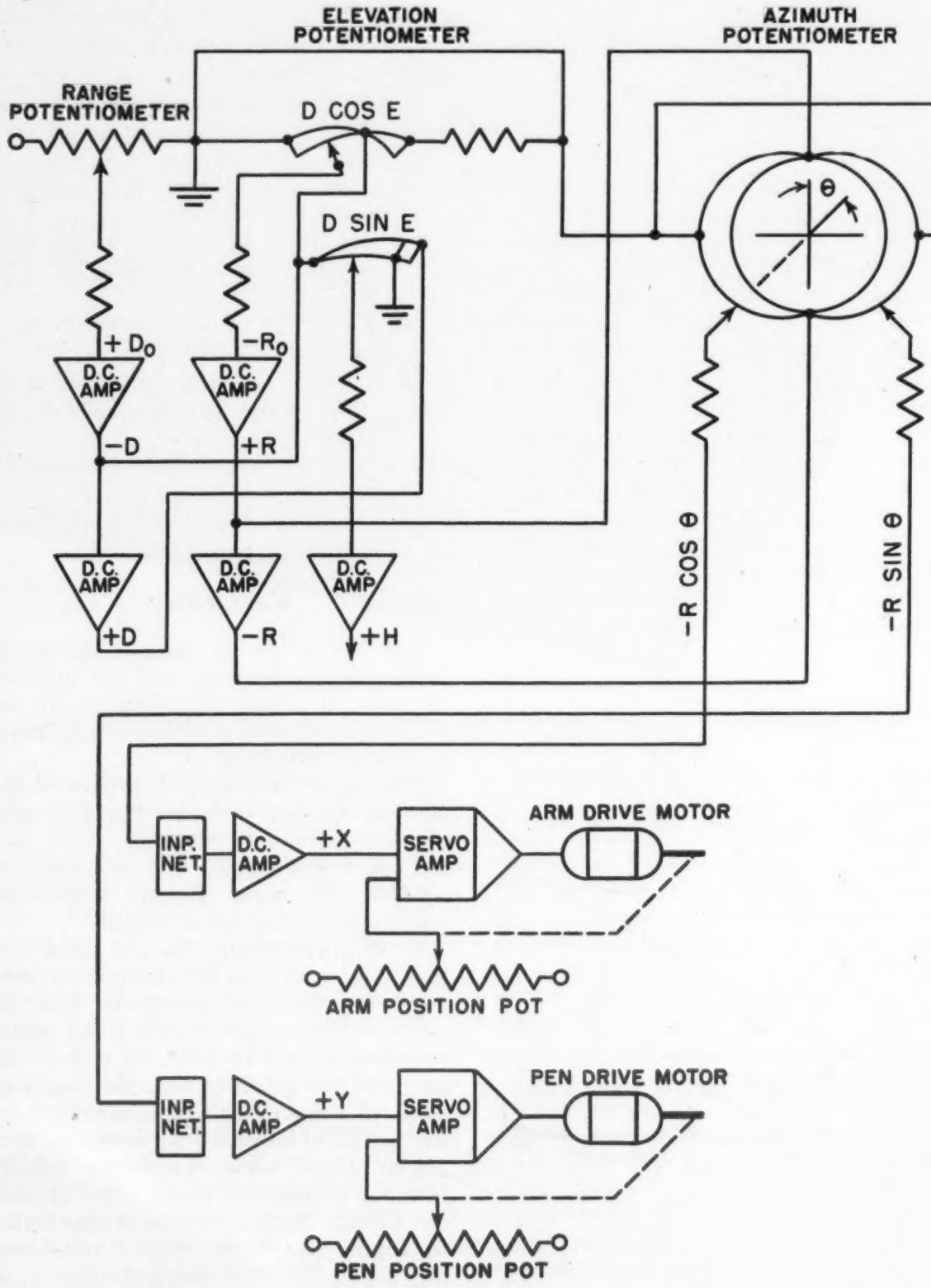
(4) Linear Time Plot—This gives a plot of range, azimuth, and elevation simultaneously as a function of time.

(5) Differential Plot—Where the position of one target is plotted with respect to the position of a second target.

These are but a few of the extensive refinements that can be added to the basic plotter to give a highly versatile instrument.

It is important to note that a high degree of accuracy is maintained throughout the plotting boards by the use of highly accurate electrical components and by strictly controlling and maintaining extreme precision in machined parts.

Fig. 4.



the "Big Noise" that launched

The Alexanderson alternator led to the formation of RCA and the development of a worldwide radiotelegraph system

Thirty years ago, on March 1, 1920, the big, noisy and expensive Alexanderson alternator was set in motion to transmit the first RCA message across the Atlantic, officially opening commercial wireless service between America and England. In that message was contained this challenge, "It is our mission to so strengthen and improve the wireless service that distance shall be made negligible and communications practically instantaneous."

Progress toward the goal set in that first message has led to the growth of the Radio Corporation of America and was the direct result of the development of a system of wireless communications second to none. The business of operating a worldwide radio-telegraph service was the door through which RCA eventually entered the fields of broadcasting, manufacturing, research, sales and technical training all of which today comprise the services of the Radio Corporation of America.

This service, founded on the vastly improved transmission made possible by the Alexanderson alternator, has since been extended to every continent and to vessels sailing every sea.

When RCA began its work it was principally with the aim of conducting an American wireless communications service across the oceans and from ship to shore. It early obtained as its heritage the work of the great Guglielmo Marconi by acquiring the British holdings in the American Marconi Company.

At the close of World War I the only company in a position to handle commercial transatlantic radio communications was the Marconi Wireless Telegraph Company of America, which was largely controlled by the British Marconi Company. The stations it had operated in America before the war were in the hands of the U. S. Government, which had taken over all such installations for wartime purposes.

At this time the best known means of long distance wireless transmission was the Alexanderson high frequency alternator, rights to which were owned by the General Electric Company. Negotiations between General Electric and the Marconi Company for the sale of alternators were under way in 1919 because the Marconi Company was anxious to expand its transatlantic services.

Efforts to Retain for U. S.

Certain high U. S. Government officials, learning of these negotiations and wishing to see America's growing international wireless service kept in American hands, suggested to the General Electric Company that negotiations be suspended until after discussions had been held with the U. S. Navy Department. As a result of these conferences with the Navy, a plan was developed for forming an American organization to take over the assets of the American Marconi Company. Two important factors in this decision were:

1. That the American Marconi Company was one link in a chain of wireless companies which had their origin in England and which extended to many countries as the result of a policy on the part of the British aimed at achieving control of this form of international communications as they had done with the cables.

2. That it was in the interest of the United States that rights to the Alexanderson alternator, an American invention of great value, should remain under American control.

So it was that on October 17, 1919, the Radio Corporation of America was incorporated and on November 20th of that same year the business and property of the American Marconi Company were acquired. It is to the everlasting credit of men like Owen D. Young, first chairman of the board of RCA; Edward J. Nally, first president and David Sarnoff, commercial manager, that they had the foresight to acquire the personnel of the American Marconi Company together with its business and property. By doing this the newly formed organization was able to start operating at a high level of

The future of U. S. radio once balanced on the assignment of rights to the Alexanderson alternator (*the "big noise"*) shown below.

efficiency and to avoid the inevitable inefficiencies which would have attended any buildup from a new start.

When RCA began business as an all-American organization, the United States had direct cable communications with only two nations of Europe — Great Britain and France, and with relatively few elsewhere. Great Britain, on the other hand, possessed an extensive system of cable contacts throughout her Empire, along the world's important trade routes, and dominated communications as her merchant ships for generations past had dominated world trade.

Aim at U. S. Pre-eminence

The primary purpose of RCA was to give the United States pre-eminence in radio communications, independent of all other countries. The aim was not only to send and receive signals and messages, but to improve and advance this new system of electric communication; to conduct progressive research and to create and manufacture consumer goods — all with the purpose of serving Americans everywhere. Great possibilities for expansion of wireless service at sea as well as for communications between and within nations were foreseen.

The task confronting the new wireless company is outlined in a report on its first year's operations:

"When it is considered that transoceanic wireless communications is practically a new art and that everything in the organization, from the messenger boy up had to be found — created, as it were — and that the staff which took over the stations from the U. S. Government on the day set for the transfer had no opportunity to rehearse the many duties connected with such a huge undertaking, it is remarkable that it could be done; but it was done." This service has continued to this day, practically without interruption.

Formative Years

The years from 1919 to 1921 cover what might be called the formative years of RCA. Radio engineers and contractors were busy building a "radio central" transmitting station on a 10 square mile tract at Rocky Point, Long Island. The receiving station was located 25 miles away at Riverhead. When construction was completed, President Warren G. Harding formally opened this great new center of radio on November 5, 1921 by sending a radiogram addressed to all nations. The 200-kilowatt Alexanderson alternators now whirled to achieve new communications records in peacetime.

By the end of 1921 RCA had succeeded in extending five transoceanic radiotelegraph circuits from the United States. These circuits then communicated with Great Britain, Norway, Germany, France and through Hawaii, with Japan. This was the forerunner of an expansion that was to make America the center of worldwide communications. Coincidentally, introduction of radio communications brought about the first direct reduction in international message rates in 38 years, undercutting cable tolls from 5 cents to as much as 48 cents a word.

Modern mechanized radiotelegraph equipment speeds messages to and from overseas terminals, sending and receiving messages automatically.

Birth of Broadcasting

Up to now, the primary use of radio had been for point-to-point communication, in which the comparative secrecy of the wireless code was sufficient to protect ordinary telegraphic confidences. For public telephone conversations, the radio was then far too public, and that fact gave false support to the idea that radio-telegraphy was a limited field.

But this very "defect" created a far greater usefulness. If a farflung audience could hear a radiotelephone message at the same time, here was a radically new means of mass communication. If radio could carry speech, it could also carry music.

Out of the realization of this idea broadcasting was born. The pioneer experiments of Dr. Frank Conrad over KDKA, the Westinghouse station in Pittsburgh, had been so successful that the Harding-Cox election returns of 1920 were broadcast to a limited number of nearby amateur receivers. News of this latest triumph of radio kindled the broadcasting "craze" which spread like wildfire across the country. Immediately, endless possibilities were foreseen for the new medium, and almost overnight, hundreds of stations were on the air.

It was soon recognized that the market for receiving sets would be determined largely by the quantity and quality of the programs broadcast. The aim of RCA was to make available radio receiving sets of the best tonal quality at prices which the public could afford. Success in this achievement inspired David Sarnoff to remark, "The richest man cannot buy for himself what the poorest man gets free by radio."

While broadcasting was making new strides daily, other phases of radio were keeping pace with it. On July 6, 1924, a radiophoto of Charles Evans Hughes, then Secretary of State, was transmitted by RCA from New York to London, where it was radioed back across the Atlantic and recorded in New York. Later in the year, pictures of President Coolidge, the Prince of Wales and other important personalities were flashed from London to New York.

Distance across the Atlantic was shrinking. The first international broadcast transmitted from Chelmsford, England, was picked up by RCA at Belfast, Maine, relayed by short-wave to New York, and there rebroadcast to the American audience. The voice of broadcasting was also becoming stronger; 50-kilowatt transmitters were being tested.

Pacific Transmission

But radio activity was not confined to the Atlantic. On May 7, 1925 facsimile messages, maps and pictures were transmitted from New York to Honolulu, 5,136 miles, over the RCA radiophoto system.

Despite all these triumphs across the hemispheres, radio never relinquished or neglected its direct link with the ocean. The primary use foreseen for wireless in the Nineties was for communication to and from ships at sea.

RCA had been engaged in marine communication since its formation. As the business developed, the Radiomarine Corporation of America was formed on December 31, 1927. It has since served as a subsidiary of RCA entirely devoted to marine radio activities—to the production and installation of radiotelephone and radiotelegraph equipment on American ships, as well as the maintenance of communications with them through its coastal stations.

To increase efficiency and to keep pace with the extension of service, RCA Communications, Inc., was organized on January 3, 1929, as a subsidiary of RCA engaging primarily in international message communication. Success of the high frequency alternators, rapid development of high power transmitting tubes and the harnessing of short waves had greatly expanded worldwide communications. In 1927, paid words handled as transoceanic traffic totalled 38,662,500; in 1920 it had been 7,000,000.

At the opening of 1930 radio was handling approximately 30% of transatlantic message traffic; 25% of South American and 50% of transpacific traffic. Brokerage offices on ocean liners were supplied Wall Street ticker service by RCA wireless. During the stock market crash of 1929, these wavelengths were extremely active. In November of 1930, when an earthquake snapped twelve cables on the bed of the North Atlantic, radio efficiently and expeditiously handled a greatly increased volume of traffic.

Pioneering Aided in War

RCA's pioneering in the field of international radio communications provided a backbone for the immediate needs of our country during World War II and proved invaluable help to the Armed Services in co-ordinating military operations in the widely separated theatres of war. RCA had established worldwide circuits which were transformed easily to war usage by all Government departments as well as the press services. In addition, the knowledge and experience of RCA engineers facilitated development and production of new and vital types of equipment for war usage.

By 1944 RCA's international traffic had reached an all-time high of 150,000,000 words. But even that record was broken the following year when 250,000,000 words were transmitted. Prewar transmission speeds of 30 words per minute were raised exactly twentyfold to six hundred words per minute.

During the early days of the war, new direct radiotelegraph circuits were established by RCA between the United States and French West Africa, Iran, Ecuador, Bermuda, Australia, New Zealand, New Caledonia and Kunming and Chengtu, China, increasing the total to more than fifty circuits.

Press Copy — Radiophotos

Besides the military and official message traffic, RCA international circuits carried a vast amount of press copy and radiophotos for American news services and newspapers. Also carried were tens of thousands of Expeditionary Force Messages (EFM), a quick and economical means of communication between overseas military personnel and their families.

RCA Communications installed, staffed and operated a number of long distance shortwave stations for the Army. The first of these was Station "X" which was opened soon after American troops landed in Italy. As they advanced into Europe, additional stations were put into operation, eventually serving the armies in France, Southern Germany and Austria. In the Pacific, a station manned by RCA personnel was opened at Manila and another at Seoul, Korea, for the Army.

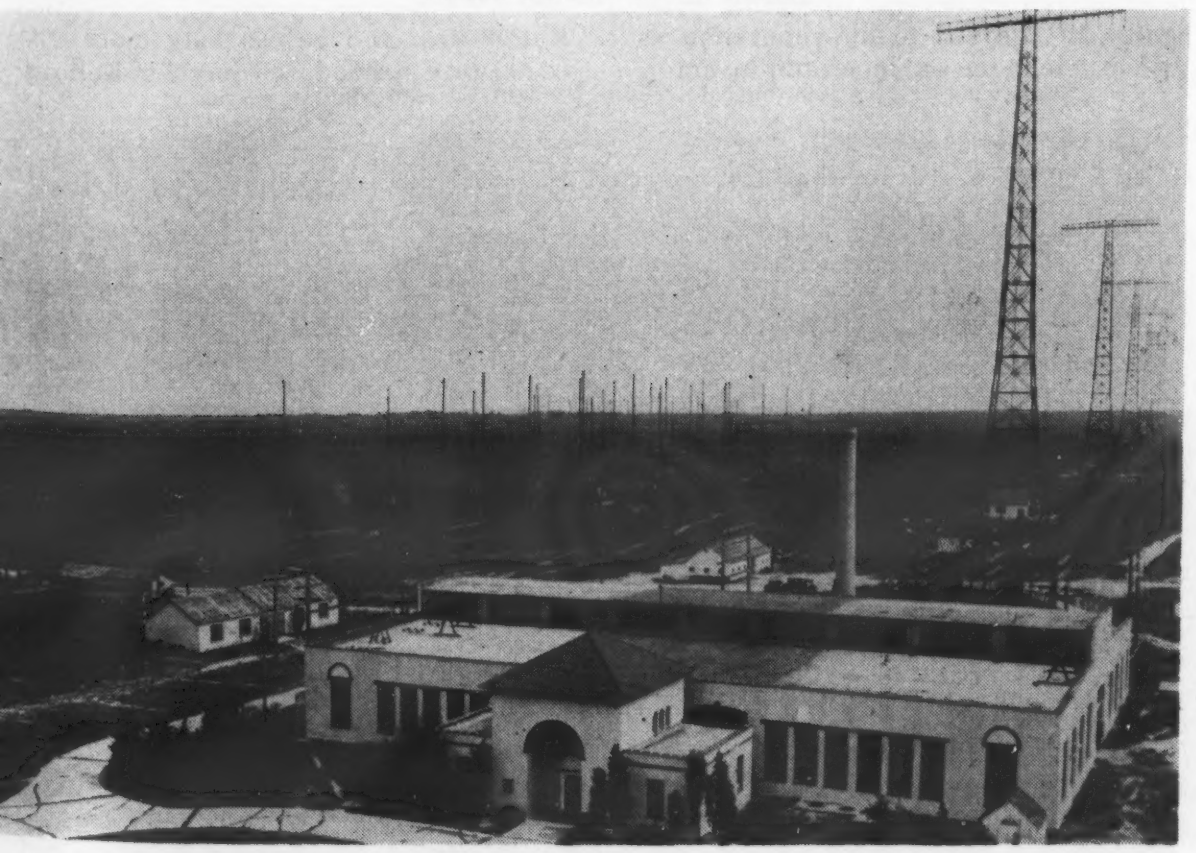
Following the job of rehabilitating radio communications in Europe and the Pacific, RCA Communications turned to the task of resuming peacetime operations. The advances made in the art of mechanized communications developed during the war now were being applied to a commercial radio telegraph system.

For almost a quarter of a century progress in the art of commercial wireless service was restricted virtually to transmitting and receiving equipment. During this same period, however, terminal office equipment and procedures remained relatively static. As new transmitting and diversity receiving apparatus brought greater stability to radio signals, it became apparent that progressive principles would have to be applied to the old operating methods if the fullest efficiency were to be realized and RCA was to keep pace with the advance made by radio telegraphy in the field.

Applying new operating techniques and methods developed during the war, RCA Communications continued to pioneer in modernizing radio's international service. The answer to greater speed and efficiency in handling increased volumes of traffic was found to be mechanical processing of messages and world-encircling automatic radio relays. This advanced system employs time and motion-saving tape relay operation, and its aim is to achieve maximum speed of service at low cost with minimum risk of errors. This is accomplished by eliminating letter-to-letter manual processing except at the point where the message is prepared for original transmission.

The application of package sets, typing reperforators, transmitter distributors, and printers, has given RCA Communications the traffic capacity and the speed of service which it must have to meet successfully the present day competition in the field of written communications.

The Rocky Point transmitting station of RCA Communications is one of the most powerful wireless stations in the world.



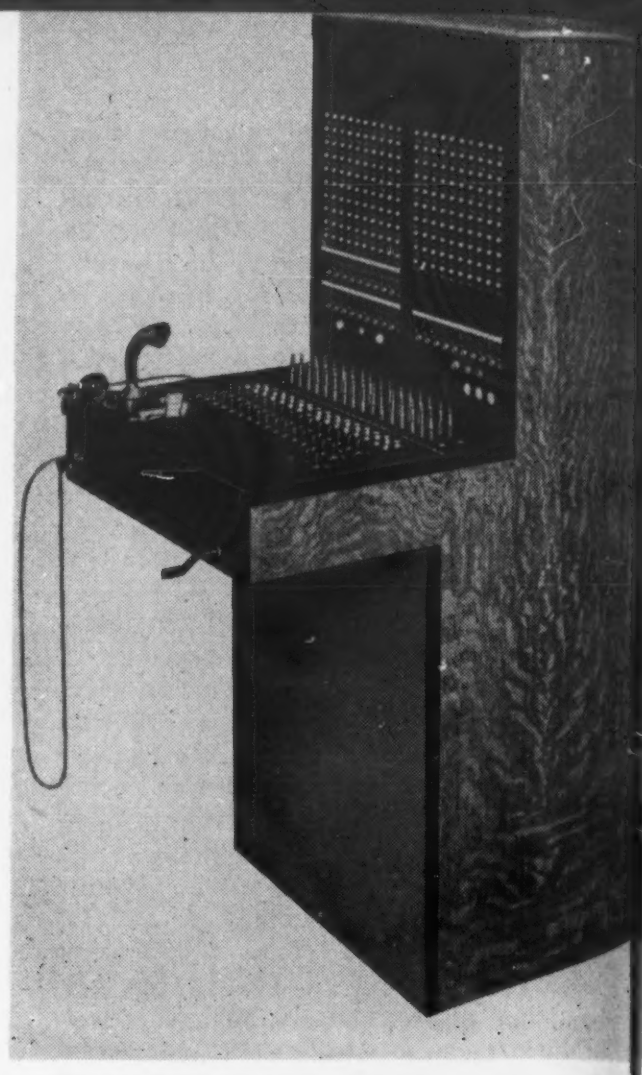
Postwar Re-adjustment

Before the end of the first post war year, RCA had reopened all direct circuits suspended during the conflict and had extended its service by opening additional radiotelegraph, radio telephone and radiophoto circuits. A powerful relay station was built at Tangier to provide uninterrupted communication with countries to which operations on regular radio paths were often difficult because of adverse atmospheric conditions. Instantaneous automatic or semi-automatic tape relay is used by this station in speeding messages to countries in Europe, Asia and Africa.

The RCA multiplex system, providing four to eight channels of communi-

(*Continued on page* 61, *col.* 1)

what KELLOGG means in modern communications



Standard PBX's floor type magneto switchboard.

If you were asked to name the thing that has contributed most to civilization, your answer might well be *communication.* Here is a word that includes many visual and audible methods as well as transportation of all kinds. Man has learned how to move about. But, equally important, he has learned how to converse with others without having to travel.

This has been one of the greatest of human achievements. Next to actual contact, where one person may see as well as hear the other, the most useful medium of communication is the voice-to-voice method made possible by the telephone. This is the story of a concern that for more than half a century has had a leading part in the art of drawing people together wherever they may be.

The history of Kellogg Switchboard and Supply Company's modest beginning, and its notable achievements and growth through the years, is one of industry's most interesting recordings. And the contributions Kellogg has made to the welfare of millions make one of the most significant chapters in the record of business, social advancement and human relationships.

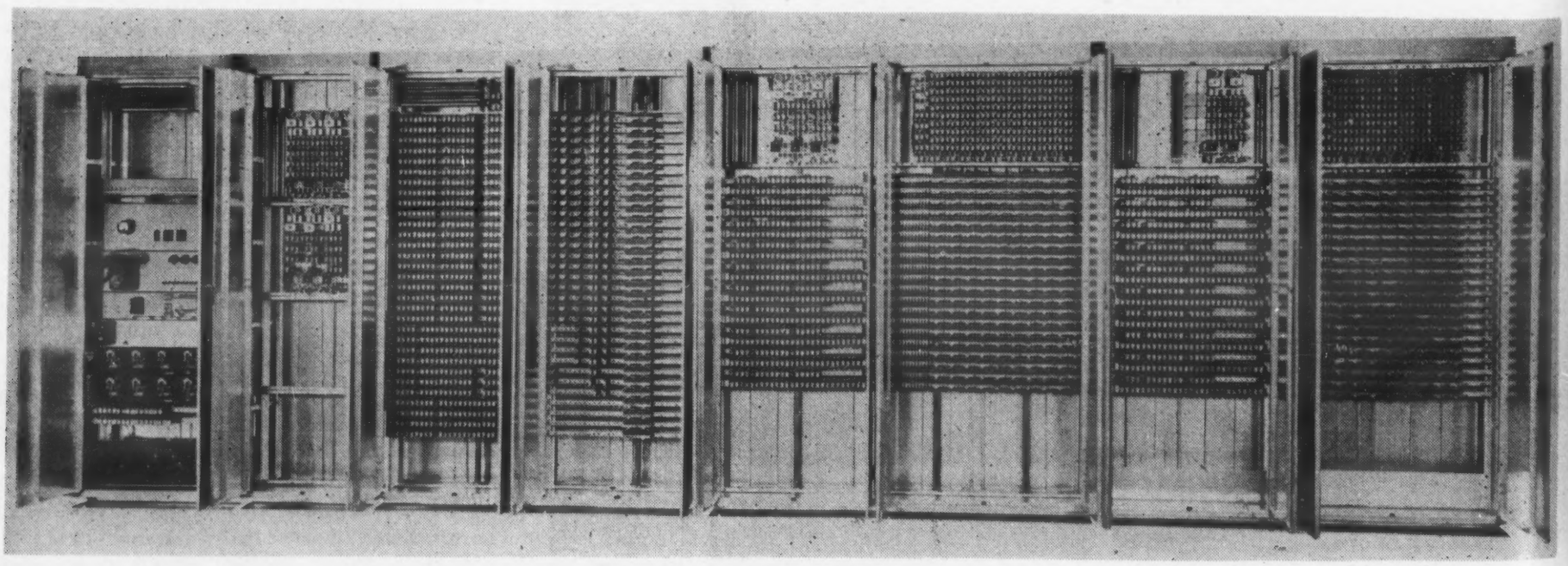
Although organized in 1897, this company had its roots in the telephone industry as far back as 1876, when Milo Gifford Kellogg became actively connected with telephonic communication. In 1890, after making an outstanding reputation in the development of telephone apparatus and circuits, he decided to cast his lot with the independent companies which were springing up in fast increasing numbers. There his loyalties remained to the end of his life, and there they have held throughout the company's existence.

Many patents were issued to Milo Kellogg. Having been active in the management of several operating companies, in addition to his reputation as a great telephone engineer and inventor, he was so well equipped in his field that when a group of St. Louis citizens decided in 1896 that they could get adequate telephone service for their city by supplying it themelves, they chose Mr. Kellogg as the man to build the switchboard and telephones for their Kinloch Telephone Company.

This equipment was built in an old schoolhouse in Highland Park, a North Shore suburb of Chicago and the original Kellogg Switchboard home. The Kinloch unit turned out to be the largest manual board ever built and housed in a single exchange room, marking one of the first major moves for independent telephony.

The project was not without skeptics. "It will never be operated," said some. But it was, and before long more sections were needed. Orders for Kellogg

Partial Relaymatic equipment for a 3000-line dial exchange showing relay equipment doors open.



switchboards began to come in from all over America and from foreign countries. More than 9,000 of them were built and installed during the first seventeen years.

Innovations followed. Style changes were made, including the first American cradle or handset telephone. Other improvements, products of a Kellogg ingenuity that has kept alert, have been accepted by the industry and the public. The Kellogg story is one of constant development. Many of these advancements have been incorporated in the products of other manufacturers.

During World War I Kellogg manufactured ignition apparatus for Liberty motors, naval range-finding equipment, and thousands of field telephones and switchboards. All-out effort in war production resumed during World War II, including manufacture for the Signal Corps of EE-8 portable field telephones, microphones, and portable manual switchboards.

The company's chief products are still telephones and switchboards fea-

Kellogg 1000 Series manual wall telephone.

turing the modern handset telephone and dial switching. Then there are carrier circuit systems, PBX, PABX and Select-O-Phone systems for inter-office use, credit authorizing systems for retail stores, telegraph equipment, microphones, and various industrial equipment. All of these products bear the Kellogg name, which for the completeness of its line and the quality of its products has always been considered one of sterling merit.

Besides equipment described here, Kellogg supplies independent telephone companies with the necessary equipment for all "outside plant" construction and operation. With warehouses in

Kellogg 1000 Series portable telephone.

Kansas City, San Francisco and Dallas, and with its present great manufacturing plant in the Clearing District of Chicago, the Kellogg company is superbly equipped to supply communications devices and materials that are in keeping with the demands of modern business and the fulfillment of household needs.

Operators of independent telephone exchanges were greatly interested when Kellogg announced its multi-channel carrier, which permits additional conversations over a two-wire metallic circuit without extra poles or lines, thus

Kellogg 1000 Series dial desk telephone.

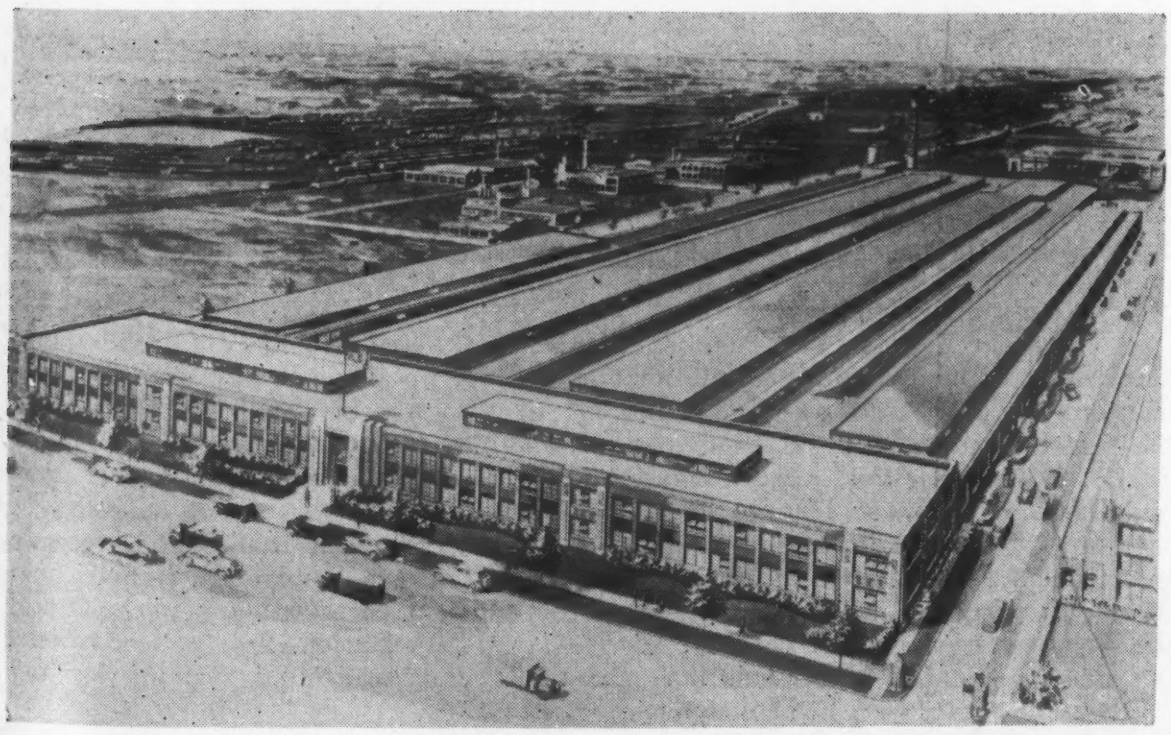
enabling management to multiply the number of channels at low cost. It is claimed that this carrier has a greater operating range, provides better voice quality, is completely dependable, and requires less maintenance. All adjustments, except voice and carrier out-put level, are pre-set at the factory. Where there is a single circuit as short as seven miles between two exchanges, or where present cross-arm and pole facilities are loaded to the maximum, the Kellogg Carrier provides a logical means of obtaining additional talking circuits without the need of more costly new line construction.

Independent operators wanted a solution to circuit problems where the transmission level was below commercial needs, particularly on through toll calls. Many companies found they were losing revenue because many toll calls had to be routed around their exchanges because of poor circuit transmission. In such cases the independent company made only the originating fee. Then came the Kellogg Repeater. When this is installed in the main exchange there is a greatly improved transmission level and quality. The independent company can handle such toll calls where they originate, and so receive all of the toll. The receiver is centrally located and available to all lines, hence the combined traffic shows a sizable increase in profit.

The center of telephone service is of course the telephone instrument itself. Kellogg's record is that of having always built superior equipment of this type, from the wall 'phones of blessed memory, through the Grabaphone or cradle model, and on down to today's triumph, the Masterphone. This is declared to be the truly modern standard of the industry, easily installed and maintained, and so simplified that only one type of base plate and two types of housing are required for almost any kind of service. The current Masterphone series, Kellogg 1000, is adaptable to common battery or magneto service, to dial or manual desk or wall service, and to any type of ringing. This has been called the telephone of the future,

(*Continued on page* 61, *col.* 1)

Plant and offices of Kellogg in Chicago, Illinois.



ASSOCIATION AFFAIRS

It's Chicago For Next Convention

Chicago is now definitely set as the site of the AFCA national annual meeting for 1951. April 19 and 20 will be the dates.

AFCA Theodore S. Gary visited National Headquarters the latter part of September and among other matters discussed included a highly encouraging report on preparations already under way by the host chapter, Chicago, for the convention next spring. The basic committees, he reported, have been set up and initial planning is well under way.

National meetings of the AFCA have always been marked by excellent shows, and next year's meeting promises to be up to the high standards of the past. Industry, instead of one of the armed services, will provide the displays, and from the start already made by the Chicago group it is assured that something outstanding in interest will be presented.

Watch for progressive reports on the buildup in planning for the 1951 convention. Projects have been suggested which indicate that the planning will develop a meeting you'll be looking forward to, and will exert every effort to attend when convention time rolls around.

Board of Directors Meet

Attend Washington Chapter Meeting

The AFCA National Executive Committee and Board of Directors held a meeting in Washington, D. C., October 18, coinciding with the opening fall meeting of the Washington Chapter at the National Press Club. The committee and directors, following their own meeting, attended the Washington Chapter luncheon gathering where the

(*Col.* 3, *next page*)

Civil Defense Report

Role of Communications Emphasized

The absolutely essential role of communications in all phases of civil defense operations, from air raid warnings to police, fire, and medical activities, again drew considerable attention in a report of a federal agency on civil defense problems Sept. 18, when the civil defense recommendations of the National Security Resources board were transmitted to Congress by President Truman.

Throughout the report—which was based to a large degree on the work done by the late Russell J. Hopley, president of the Northwestern Bell Telephone Co., during his service in charge of U. S. civil defense planning—the paramount requirement for adequate basic and standby communications facilities was emphasized.

The proposed new Civil Defense Administration, although it generallly would be a planning and coordinating agency, leaving the actual operations of the civil defense program to states and municipalities, would be given more specific operational responsibilities for communications under the legislative draft setting up the CDA, which accompanied the report.

Under the proposed law, the Civil Defense Administrator would "install, equip, staff ,and operate centers of communications to provide: warnings of enemy attack by air or otherwise; direct, secondary, or supplemental channels of communication to state, regional or local civil centers or offices or any services; provide aid and assistance to the states or their political subdivisions by furnishing communications equipment; and provide assistance in the installation, maintenance and operation of communications necessary for civil defense or to meet or prepare for enemy attacks."

The report brought out that the primary financial burden of the civil defense program would be on the federal government, as otherwise the risk would be run that the program would be inadequate in some areas, and that primary industrial areas, more likely to be targets, would pay a disproportionate share of the nation's civil defense bill.

President Truman has announced that, in the period before Congressional enactment of civil defense legislation, he will set up a temporary Civil Defense Administration, based on the framework of the present group within NSRB. No specific moves have yet been made to establish the temporary office. Meanwhile, it is understood that a new communications specialist will report next week for civil defense planning duty at NSRB.

In its section on communications the report stressed that sound, flexible plans must be developed so that communications in some form will be available in any emergency. Facilities required, in addition to warning service, would be links between control centers; service for transportation, fire, police, rescue, warden, medical, and engineering personnel; and air-ground systems for use with planes employed in civil defense activities.

Control centers, it was pointed out, would be "essentially centers of communications" for the receipt of attack warnings and the initiation, direction, and control of civil defense activities. They should be located wth regard to the availability both of primary and standby communications services, the report brought out.

The federal civil defense agency would be responsible not only for overall planning and coordination with the FCC, Defense Department, and other government agencies, but also would establish technical specifications for civil defense communications. State and local communities chiefs, under the plan, would be appointed, with particular responsibilities for surveys of needs and facilities available, and for working with commercial communications companies, amateurs, and others prepared to provide the services.

The report brought to a close the civil defense service of Paul J. Larsen, former consultant to the Sandia Corp., which operates the Sandia, N. Mex., Laboratory for the Atomic Energy Commission as a Western Electric Co., subsidiary. He was succeeded by James J. Wadsworth, son of the veteran and highly-respected New York Congressman and former Senator, who is retiring at the close of the 81st Congress. Mr. Wadsworth will be acting Director of the Civil Defense Office of NSRB. Mr. Larsen, in his letter of resignation, said that civil defense, in moving from the planning to the operating phase, requires "a person having a broader administrative and organizing background than mine."

Copies of the report have been sent to thousands of persons in state and municipal capacities whose services will be required in establishing a nationwide system of civil defense services, under federal coordination but with local responsibility, as initially visualized by Mr. Hopley.

At numerous points in the report, communications requirements were stressed. Mobile systems were emphasized particularly in the sections on police and fire protection, because of the possibility that basic landline systems would be damaged in enemy attack. In the police section, it was noted that it is vitally important that "all possible alternate and auxiliary communications systems be developed. In many states and communities, the police short wave radio system is the only mobile means of communications."

Discussing the present provisional air raid warning system operated by the U. S. Air Force, the report said the system "includes personnel and terminal telephone equipment with which to initiate warnings at the military control centers, and it provides special telephone equipment installed in strategic locations, where civil defense authorities can receive warnings for further dissemination throughout the state, or to subdivisions of the state which are designated as warning areas.

"The toll services of commercial telephone companies have been integrated into the system to provide the link between the air raid warning officers at the military control centers and the special air raid warning telephones throughout the country. Special procedures have been adopted by the telephone companies to assure prompt transmission of warnings." Pointing to the potential damage which could be caused a typical U. S. city by atomic attack, the report devoted a chapter to the plight of "city X" after enemy atomic bombing. Three telephone exchanges suffered major damage in "city X", and another was contaminated. Radio stations within the heavy damage area were desroyed.

(*See complete text on communications page*)

Chapter of the Year, 1950

AUGUSTA-CAMP GORDON

President—Henry J. Hort
Past Pres.—Hugh Fleming
Secretary—P. K. Jones

1951 Contest Chapter of the Year

As of August 31st, AFCA's leading chapters in the 1951 chapter of the year contest were:

Sacramento
San Francisco
Philadelphia
Boston
Seattle
Chicago
Pittsburgh
Cleveland
Augusta-Camp Gordon
New York

ROTC Photographic Contest

See next page

Chief Signal Officer, Major General Spencer B. Akin, was the speaker. General Akin spoke on "Communications in Korea," relating his observances during his recent inspection tour of the war zone.

Electronics Personnel In Demand

The importance of electronics-communications in defense and in warfare has been pointed up continuously since the beginning of the Korean communistic aggression by the immediate and continuing demand for electronics-communications personnel. The armed services and industry both have requested the AFCA to publicize their need for qualified personnel in this field. This has been done in the News Letter.

The Westinghouse Corporation is ad-

Addresses Unknown

Copies of SIGNALS mailed to the below listed members have been returned to us because the latest addresses we have for these names are incorrect. If you know the present address of any of these members please jot it down on a postcard and send it to us.

W. H. Anderson
Private Carol M. Appel
Gregory J. Ardizzone
Lt. William A. Bochinno
Paul H. Bacon
Sam H. Ball
Capt. Carl F. Beall
1st Lt. Wallace J. Bennett
Walter C. Blatner
T/Sgt. Curtis Brassaw
Maj. Shannon D. Brown
Pvt. Fred Browning
Maj. George J. Callaghan
Leon T. Campbell
Lt. Col. Steven S. Cerwin
2nd Lt. John A. Colborn
Joseph Corig
M/Sgt. Clayton R. Curtis
Ernest B. Cutler
D. C. Davis
Capt. Milton L. Deacon
Sgt. James A. Devlin
Carl P. Dunkel
Monroe S. Edwards
1st Lt. Claude A. Ernst
Sgt. Ernest T. Gervais
Louis Giovanos, Jr.
Maj. Linwood O. Green
Capt. Fred J. Hays
Arlice T. Henry
Capt. George Herget
L. M. Hershey
Butler P. Hine, Jr.
Capt. Albert E. Hodsdon, Jr.
1st Lt. William F. Hogan
1st Lt. George A. Icenhower
Cpl. Leonard W. Jackson
John Jarrett
Jesse A. Key
Capt. John D. Kinert
Col. Kenneth W. Klise
Lt. Col. Stanley A. Kretlow
Capt. Robert E. Lee
1st Lt. Raymond W. Lemme
Capt. Gerard Lynch
1st Lt. John W. Marshall
L. Mayberry
Capt. John C. McIntyre
Maj. George A. Meuer
Philip N. Migdal
Walter B. Mitchell
Sgt. Charles A. Montague, Jr.
WOJG Newton H. Morgan
M/Sgt. Doyle W. Morris
Pvt. Ruth E. A. Mussell
1st Lt. Robert A. Neubauer
Phillip L. Newton
Cpl. Harry N. Pasley
W. L. Peacock
Capt. Henry W. Pike
Capt. R. J. Price
1st Lt. Philip L. Rancourt
George L. Renfeldt, Jr.
Sgt. William Resler
Cpl. Albert Riggs
Maj. Aldred W. Rogers
2nd Lt. Bernd Ross
Norman C. Saunders
Capt. Francis M. Spurlock
Lt. Col. William F. Starr
Col. Ira F. Stinson
G. F. Thompson
Lt. Col. Thomas K. Trigg
Sgt. Ray C. Turner
1st Lt. Alden Van Popering
Capt. Walter L. Weaver
Lt. Alton R. Wheelock
S/Sgt. Henry Wilson

vertising in this issue for electronics engineers and technical writers.

Telephone engineers are wanted by Walter H. Kessler, Consulting Engineer, Washing on Building, Washington 5, D. C. This should be attractive to retired Bell System engineers, because Mr. Kessler has stated that age is no factor in his requirements. The positions pay up to $10,000, plus traveling expenses, and considerable traveling will be involved. Engineers with plant experience are preferred.

This announcement may be somewhat late, because Mr. Kessler was anxious to fill these positions as quickly as possible at the time SIGNALS learned of his needs, and the publishing period involves something of a time lag since he first made his needs known. But it still may be worth a try for anyone interested.

ROTC PHOTOGRAPHIC CONTEST

Prizes! Winner To Be Published In SIGNALS!

Sponsored jointly by the AFCA and the Office of the Chief Signal Officer, a photography contest for which all Signal Corps ROTC cadets are eligible has been opened for entries until 2 January 1951. While arrangements for prizes have not been entirely completed, it can be assured that they will be highly suitable. All of the top winners will be published in SIGNALS. watch the AFCA News Letter and the Signal Corps ROTC Information Letter for announcements of prizes and further details.

Here are the contest rules:

1. All entries will be mailed to the Office of the Chief Signal Officer, The Pentagon, Washington 25, D. C., Attn: SIGMT-5. No more than six entries may be made by each contestant.
2. No contestant will be awarded more than one prize.
3. The contest ends 2 January 1951, and entries must be postmarked not later than midnight of that date. Pictures made at any time during calendar year 1951 may be entered.
4. There is no limitation on subject matter.
5. The contestant must be a Signal Corps ROTC cadet.
6. Each entry must be accompanied by caption material describing the subject briefly, giving name, address, ROTC affiliation of the photographer, date picture was made, type of film used, stop opening, and shutter speed.
7. Each entry will consist of the original negative and one 8x10 black and white print.
8. Unused pictures will be returned. Negatives of those selected will be retained by the OCSigO.
9. The OCSigO reserves the right to make use of all pictures submitted. All portraits must be accompanied by a statement signed by the subject or subjects authorizing reproduction and use in connection with publicity.
10. The OCSigO assumes no responsibility for loss or damage of entries.

AFCA GROUP MEMBERS

Communications—Electronics—Photography

Listed below are the names of the American firms who are group members of the Armed Forces Communications Association. By their membership they indicate their readiness for their share in industry's part in national security. Each firm nominates several of its key employees or officials for individual membership in AFCA, thus forming a group of the highest trained men in the electronics and photographic fields, available for advice and assistance to the armed services on research, development, manufacturing, procurement, and operation in our special fields.

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American Phenolic Corporation
American Radio Institute, Inc.
American Radio Relay League
American Steel & Wire Company
American Telephone & Telegraph Co.
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Arnold Engineering Company
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Cornell-Dubilier Electric Corp.
Corning Glass Works
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Eastman Kodak Company
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Electronic Associates, Inc.
Electronic Designs, Inc.
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International Resistance Co.
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Lewyt Corporation
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Magnavox Company
Mallory & Co., Inc., P.R.
Martin, Glenn L., Company
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Motorola, Inc.
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National Carbon Company, Inc.
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New Jersey Bell Telephone Company
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Northwestern Bell Telephone Co.

Oak Manufacturing Co.
Ohio Bell Telephone Co.
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Operadio Manufacturing Company

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Telephonics Corporation
Teletype Corporation
Times Facsimile Corporation
Transmitter Equipment Mfg. Co.
Tung-Sol Lamp Works, Inc.

United Radio Television Institute
United States Rubber Company
United Telephone Co.

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Western Union Telegraph Co.
Westinghouse Electric Corp.
Weston Electrical Instrument Corp.
Willard Storage Battery Company
Wisconsin Telephone Company
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CHAPTER NEWS

National Director of Chapters: W. W. Watts, RCA Victor Div., Camden, N. J.

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NATIONAL HEADQUARTERS CHAPTERS SECRETARY: JULIA B. GODFREY

CHAPTER NEWS

Augusta-Camp Gordon

The Southern Bell Telephone & Telegraph Company was host at the chapter's August 10th meeting which featured a tour of the telephone plant at 937 Greene Street, Augusta.

A dial demonstration unit was used to show the steps of each dialed digit towards completing a call. The functions and records of the business and assignment offices and repair department were explained. Members expressed astonishment at the amount of office equipment and wiring necessary for local and toll service and were especially interested in the coaxial cable equipment.

After visiting the toll operating room where the "voice with a smile" prevails, the chapter members and guests gathered in the cafeteria for refreshments and a social hour.

Boston

Chapter President T. F. Halloran and Treasurer Gardiner Greene recently called on John F. Stokes, Director of Civilian Defense for the State of Massachusetts, to offer the services of the Boston Chapter in the civilian defense program.

A membership drive, headed by John B. Russell of the S. H. Couch Company, has been inaugurated by the chapter which has steadily increased in size and activity since its reactivation last April. The entire Boston Chapter has been drafted into assisting in the drive. A list of prospective members, both individual and group, in the New England area has been sent by Admiral Halloran to each member with the request that he visit those companies or individuals listed in his particular vicinity and acquaint each with the objectives and the activities of the association and the chapter.

Chicago

Chicago also reports that it has taken action to further the civilian defense program. Its services have been offered to both the governor of Illinois and to the mayor of the city of Chicago.

The first fall meeting will be held September 27th and will feature the color film, "Functional Photography in Industry," which the Eastman-Kodak Company has made available for the use of AFCA chapters.

Initial preparations for the AFCA National Meeting, to be held in Chicago next spring, have gotten underway in the chapter with basic committees already set up. The association's national president, Ted Gary, visited Washington Headquarters September 25th and discussed with Secretary Dixon and with SIGNAL's staff the action already taken by the Chicago chapter and the planning for other preparations and for publicizing the convention. These details, and future developments will be more fully reported in the Association Affairs columns of SIGNAL.

Columbus

A new AFCA chapter is in the process of being organized in Columbus, Ohio, under the leadership of Kenneth C. Goodman of station WBNS-TV. Plans are now underway for an organization meeting of all AFCA members and other communications-electronics-photography people in the area.

New York

Despite a steady downpour brought on by the hurricane which hit the southeastern coast, 95 members of the New York Chapter turned out for a most interesting meeting on September 13th which featured Dr. J. O. Perrine, asst. vice president of the American Telephone & Telegraph Co., and his demonstration-lecture on "Micro Radio Waves in Civil and Military Communications." Dr. Perrine, it will be remembered, presented a similar lecture before AFCA's four Southern chapters last fall.

Colonel George Dixon, AFCA National Executive Secretary, gave a short talk on the importance of fostering good fellowship among AFCA members, both old and new, at chapter gatherings, and told the local chapter about some of the things that national headquarters are working on.

Among those present were Maj. General H. C. Ingles, president of RCA Communications; Rear Admiral Ellery Stone, president, International Standard Electric; Ralph Grist, president of AFCA's Atlanta Chapter; Brig. General C. O. Bickelhaupt, vice president, AT&T Company; Rear Admiral S. F. Patten, assistant to the president, Dumont Laboratories; Rear Admiral Roy W. M. Graham, assistant manager, equipment sales division, Raytheon Mfg. Co.; and an excellent representation from member companies, such as Western Electric, AT&T, RCA, Times Facsimile, IT&T, etc.

Cocktails and an opportunity to meet and talk with many old friends preceded the dinner at Schwartz's Restaurant in downtown New York. Chapter President Tom Mitchell was as usual the perfect M.C.

Dr. Perrine's demonstration-lecture was enthusiastically received, and he proved himself again the past-master in gaining and holding the interest of his audience.

Secretary Dave Talley and the entertainment committee deserved a lot of credit for the large attendance on such a bad night.

Philadelphia

Harry A. Ehle, vice president of the International Resistance Company and long active in national and local AFCA affairs, has been elected president of the Philadelphia Chapter to succeed Wally Watts who had served as president since the chapter's organization early in 1947.

L to R: F. M. Fister, retiring pres. of South Carolina chapter, congratulates John L. H. Young, newly elected president.

The other new officers for the year are: 1st vice-president — Leslie J. Woods, vice-president, Philco Corporation; 2nd vice-president — Russell E. Cramer, Jr., vice president, Radio Condenser Company; secretary—J. R. Curley, RCA Victor Division; treasurer—Henry E. Wirth, Singal Corps Stock Numbering Division.

Pittsburgh

A tour of the West Penn Power plant in Springdale, Pa., marked the first fall meeting of the Pittsburgh Chapter on September 12th. The plant is the second largest power producing plant of the West Penn Power Company which supplies power for the area surrounding Pittsburgh, Northern Pennsylvania, West Virginia, Ohio and Maryland. The tour was of special interest to the chapter members since the plant is a part of a net work vital to the defense industry in the Pittsburgh area.

A pre-meeting dinner was held at St. Marks Lutheran Church.

St. Louis

The St. Louis Chapter, inactive for the past year, is being reactivated under the leadership of Col. G. E. Popkess, Jr., who organized the chapter in 1947 and served as its first president. Judging from the steadily increasing number of new members coming in from Scott Air Force Base, the chapter will have a good sized Air Force representation.

Rochester

An AFCA chapter is now being lined up for the Rochester, New York, area. Joseph C. Wilson, president of the Haloid Company (manufacturers of photographic products), has undertaken the responsibility of organizing the new unit. Present and prospective members of the association will soon be apprised of plans for the initial meeting.

CHAPTER NEWS

San Francisco

The board of directors of the San Francisco Chapter met on August 3rd to determine the course of action to be taken by the chapter in connection with current activities in civilian defense and disaster relief. After a thorough discussion it was decided that the only services the chapter had to offer were those of consulting and planning in the communications part of local civil defense plans, and Chapter President Harry E. Austin, of RCA Victor Division, was authorized to offer such services to the San Francisco Disaster Council and the Alameda County Disaster Coucil.

Seattle

The results of a recent meeting of the local civil defense authorities, at which Maj. General Frank E. Stoner, Lt. Col. Clarence Lawrence and Major James Campbell represented the Seattle Chapter of AFCA, were reported to the chapter membership at its August 30th meeting.

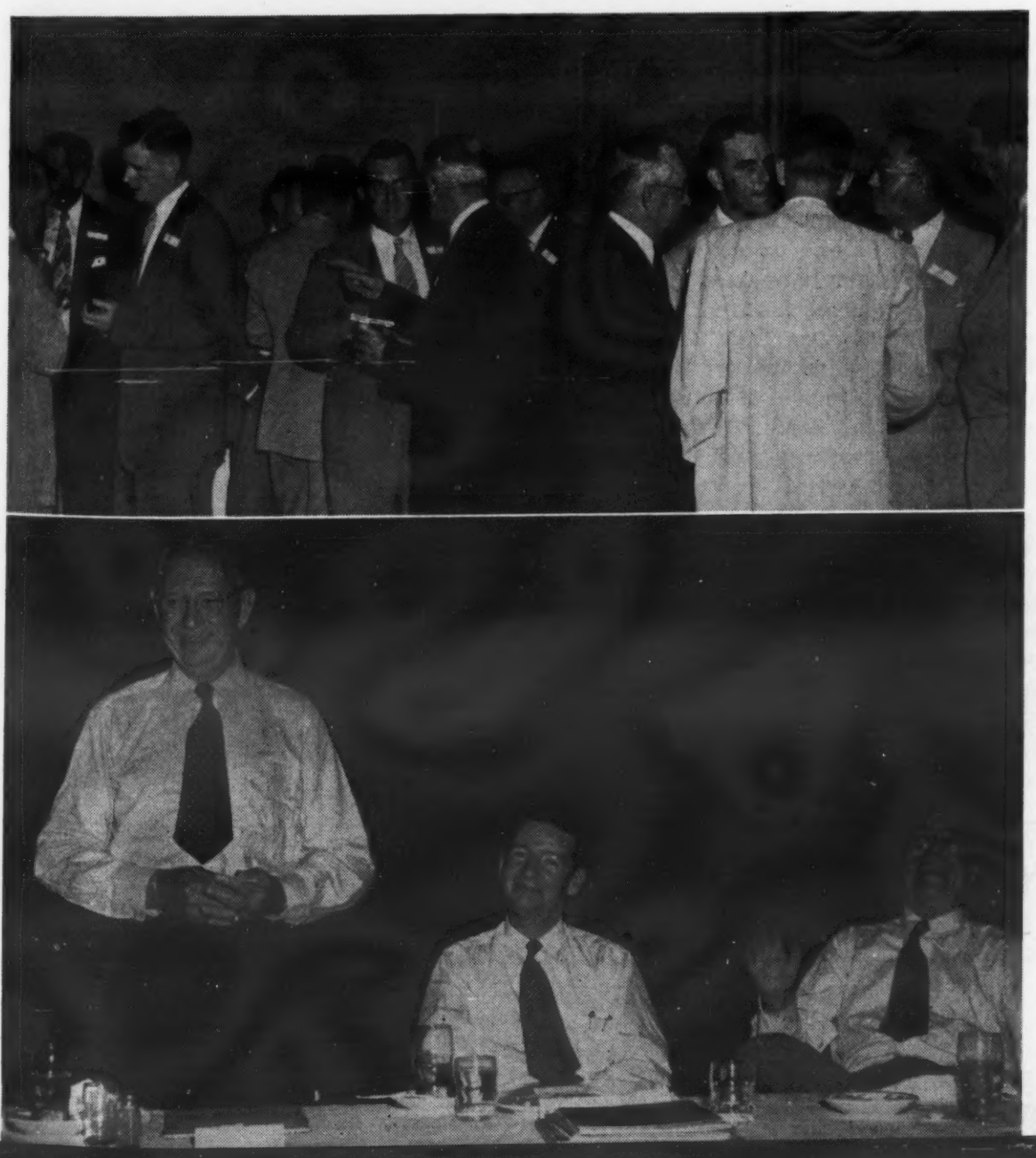
President Lawrence stressed the importace of increased membership and the valuable service the chapter could render the civil defense authorities in the event of an emergency. He pointed out possible ways in which the chapter could strengthen civilian defense and paid tribute to the invaluable assistance rendered by the many community-minded radio amateurs.

Maurice Kerr, former chapter president, suggested that meetings be utilized to better acquaint the members with the local defense system and to evaluate the possible needs of communications equipment in actual circumstances. He then made a motion, which was adopted, that the chapter forego its practice of holding bi-monthly meetings and instead meet every month until the present emergency is over.

Major Campbell, entertainment chairman, turned the program over to two chapter members, Lee David and Warren Taylor who own and operate the National Filrm Productions Company of Seattle. They entertained the group with a color film of the Olympic Centennial photographed by their company. The film depicted the week-long event with great detail: the many notable speakers, such as Governor Langley of Washington; the commanding officer of Fort Lewis; George Gunn, president of Greater Seattle, Inc.; the mayor of the city of Olympia; and the queen of the event; the parade which featured the old and the new in many variations; the many colorful floats, etc.

The next chapter meeting is to be devoted to the subject of the civil defense program.

Upper photo: Portion of the turnout for the South Carolina chapter meeting. Lower: Retiring chapter president F. M. Fister (center) and W. H. Mansfield, So. Eastern area representative enjoy a quip by Executive Secretary George P. Dixon.



South Carolina

AFCA's National Executive Secretary George P. Dixon was guest speaker at the South Carolina Chapter's annual meeting in Columbia on August 3rd. He emphasized the association's goals which include preserving the feeling of cooperation which existed between the armed forces and the communications industry at the end of the second World War.

Chapter President Fred M. Fister of Southern Bell opened the meeting with a statement of the association aims and introduced guests from two other AFCA chapters: Ralph Grist, president of the Atlanta Chapter; William H. Mansfield, AFCA national director and past president of the Atlanta Chapter; Colonel Henry J. Hort, president of the Augusta-Camp Gordon Chapter; Hugh A. Fleming, past president of the Augusta-Camp Gordon Chapter; and Johnnie Owen of Augusta-Camp Gordon.

Colonel Dixon commended the chapter on its first year's work and suggested an expansion of the base of the organization into members from the independent telephone companies, ham radio operators, photographers, power representatives, and other personnel He stated the chapter should emphasize membership, program and civil defense.

After Colonel Dixon's talk, the members and guests saw a film, "Operation Co-operation," which showed scenes of the national AFCA convention meetings in New York and the demonstration tour of dozens of phases of Signal Corps work at Fort Monmouth.

Newly elected officers for the coming year were installed as follows: president—John L. H. Young, Southern Bell Tel & Tel; 1st vice-president — Samuel A. Ferguson, University of South Carolina; 2nd vice-president— Comdr. Julien J. Edgerly, Charleston Naval Shipyard; secretary — Carl E. Newman, Southern Bell, Columbia, treasurer—Jack Pickell, Southern Bell, Charleston.

Washington

In preparation for chapter activities in the fall, Comdr. Guy M. Neely, chief engineer of the Office of the Director of Naval Communications, has been appointed chairman of the membership committee, and Col. Percy G. Black, assistant vice-president of Automatic Electric Company, is heading up the program committee. Roland Davies, editor of Telecommunications Reports, has again been named chairman of the publicity committee. W. P. Dutton of RCA Victor has been chosen assistant secretary and treasurer of the chapter and will take over the duties of Col. E. C. Cover, chapter secretary, who was ordered to active duty on September 3rd. Col. Black has been active with his committee, and planning has resulted in a luncheon meeting, tentatively set for October 18th, with a prominent speaker.

NEWS—SERVICES and INDUSTRY

GENERAL

Harrison Issues First NPA Orders

Inventory Controls Aim At Hoarding

With the end of the Korean war in sight, barring further interference by other communistic forces, the Department of Defense and other mobilizations leadership in Washington are endeavoring to impress upon the nation that the national defense preparedness efforts must not be slowed up because of the potential dangers from the Soviet in Europe and Asia and the Middle East.

Out of the confusion which has existed during the summer in a number of segments of the defense and mobilization "front" in Washington, there are growing signs of greater uniformity of policy and balance in decisions—this is particularly true in the case of the National Production Authority, headed by Major General William H. Harrison, on leave from the International Telephone & Telegraph Co. presidency.

The NPA early in October was ready to issue its new order on military priorities and allocations of critical and strategic materials which would undoubtedly give a definitive index on the position of civilian communications and broadcasting-television in the scale of obtaining its share of metals in short supply. Telephone, telegraph, and international communications are certain to be in the same category of preference as they were in World War II because of their indispensability to industry and the civilian population, especially for civil defense.

The first broad-scale order of the new National Production Authority, establishing general inventory controls to prevent hoarding by manufacturers, and setting up a list of critical materials, climaxed the first week of intensive activity by the NPA administrator, and his staff, following General Harrison's formal induction into the key defense effort assignment Sept. 11.

Moving quickly to set up his organization and establish basic policies and orders—a job severely compilcated by the half-war, half-peace status of the nation and the fact that administration leaders do not appear certain how much they want in the way of mobilization and controls at this time—General Harrison held important meetings with steel and primary copper producers at the outset of his first week as NPA administrator. while at the same time moving rapidly to set up the organization to administer priority, allocation, and inventory controls.

The job was complicated by the usual birth pangs of any emergency

(*Continued on page* 52, *col.* 2)

New Defense Secretary Knows Worth of Communications

Appointment of General George C. Marshall as Secretary of Defense brings to that post an official who is thoroughly familiar with the communications services of the armed forces, especially the world-wide network of the Army Signal Corps, because they were his valued tool of command when he was Chief of Staff in World War II. With his selection, the Defense Department is to be headed by one of the nation's most noted military leaders, and one who is thoroughly familiar with all phases of the armed services, including communications.

General Marshall likewise has close relationships with the Department of State, where he served as secretary for two years. General Marshall brought over to the State Department, when he accepted that cabinet post, a number of former general staff officers, who had been among his principal aides during the war. One of them was Carlisle Hummelsine, who was recently appointed to the position of deputy under-secretary for administration of the State Department, and who during the war was in command of the general staff communications center.

Another former officer brought into the State Department by General Marshall was Col. Walter K. Scott, who was appointed by the State Department Sept. 12 as deputy assistant secretary for administration, succeeding Mr. Hummelsine. Mr. Scott previously was chief of the State Department's division of communications and records, and director of the office of departmental administration. Most recently, he had served as the deputy general manager of the Voice of America program in the department. During World War II, he was first assistant secretary to the SHAEF general staff and later secretary to the general staff of the headquarters of the United States forces in the European theater of operations.

Gifford Appointment Acclaimed

The wisdom of the selection of President Truman and Secretary of State Dean Acheson of Walter S. Gifford, for a quarter of a century president of the American Telephone and Telegarph Co., and retired chairman of its board for the past two years, for the nation's leading ambassadorship to Great Britain was accorded universal acclaim throughout the United States and in Great Britain and the British Commonwealth because of Mr. Gifford's exceptional capabilities, integrity, and broad background of economic, financial, and public service experience.

Mr. Gifford's speedy confirmation by the Senate when Congress reconvenes Nov. 27 appeared assured since both leading Democratic and Republican Senators who were still in Washington hailed Mr. Gifford's selection as one which will bring credit to the nation.

As an outstanding industrial statesman and the chief executive of the world's leading industrial organization, the Bell System, for a quarter century, and with his long service and interest in humanitarian and philanthropic services, Mr. Gifford goes to London with great qualifications for the most important diplomatic post of the United States in the world. The U. S. Ambassador to the Court of St. James is also largely regarded somewhat in the category of an alter ego to the Secretary of State in Europe and for the British Commonwealth.

Mr. Gifford's selection, it is known, came from Secretary of State Dean Acheson who strongly urged his appointment to the President. Secretary of Defense George C. Marshall likewise is understood to have strongly supported Secretary Acheson in advocating Mr. Gifford's apointment.

That the designation of Mr. Gifford was entirely acceptable and welcomed by Great Britain was exemplified by the record speed in the approval of his choice by the British Foreign Office. Mr. Gifford's name was transmitted, it was understood, by Secretary Acheson to the British Government September 26, and in five hours King George and Prime Minister Atlee had replied with full approbation of the new ambassador-designate. The speedy approval was cited by State Department sources as a record of quick action.

Even though Mr. Gifford had retired from the Bell System last January after having past his 65th birthday, it is known that he was not content to remain inactive in the present world situation. But it might be cited that he was devoting serious efforts in the affairs of the philanthropic and social organizations where he holds high advisory posts. It was also learned that during recent months his name

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had been considered in Washington for several important positions, but these proposals for his service were, of course, pushed into the discard when he was proposed several weeks ago by Secretary Acheson for the ambassadorship.

Radar Fence Nearing Completion

The radar warning "fence" covering the continental United States will be completed well before the previous July 1 target date, probably by March 1, Undersecretary of Air John McCone informed a House Armed Services subcommittee which is investigating U. S. preparedness last week. Mr. McCone said that Alaska stations will not be finished by July 1, but will be substantially completed by the end of the 1951 construction season, in November. By July, the Air Force official reported, personnel and equipment to man all the stations in continental U. S. will be functioning.

Continued increase in the Air Force's strength was depicted by Mr. McCone, with a possible goal of 95 groups, well beyond the present estimate of 69 groups. Expansion of the size of the Air Force, of course, means additional heavy demands on the electronics-communications manufacturing industry.

Security Clearances Simplified

Uniform policies designed to simplify and expedite the entire security clearance procedure for contractor employees and facilities on military contracts have been adopted by the Army, Nav, and Air Force.

The policies will eliminate duplicate security investigations of the same contractor and his personnel by the three military departments, which it is expected will enable the departmental agencies to expedite essential security clearances.

Security clearances of facilities and personnel are considered by the military departments only in connection with bids and contract work involving classified military information. A prospective bidder or contractor is required to have a facility clearance before he is given classified information to be used in preparing a bid on a classified contract or for use in negotiations prior to the award of a contract.

Inquiries concerning security clearances should be made directly to the military procuring activity concerned, and should not be directed to Washington unless such activity is located in Washington. Final determination as to whether or not a facility clearance is required on any type of defense work rests with the military procuring office handling the contract. Locations of the procuring offices may be obtained from the Munitions Board.

Akin Lists Some Requirements

CSO Stresses Fast Delivery Need

The major emphasis on swift delivery by manufacturers of the armed forces' needs now was further pointed up in the announcement that the Army's Chief Signal Officer, Major General Spencer B. Akin, had recently completed a tour of principal manufacturing centers where he visited heads of the communications-electronics industry.

During his visit tour of manufacturing concerns General Akin stressed the need for expeditious production by the contractors to insure the fastest deliveries possible on equipment now on contract. He explained that Signal Corps procurement plans are completely settled except for quantities which will depend upon developments of the current situation.

As brought out following the announcement regarding General Akin, large dollar value items of procurement by the Signal Corps during the coming year will include: new lightweight teleprinter equipment, a 500-watt amplitude modulated radioteletype, high frequency radio relay terminal signal unit, high frequency radio relay terminal (double unit, used back to back), 12-channel radio relay equipment, fixed antenna equipment to go with larger radio sets, new lightweight field mine detector, low altitude radiosonde equipment, and new 16-millimeter motion picture projector equipment.

In addition to the above specified items of equipment, General Akin said that large dollar volume of procurement would also include dial switchboard equipment, dry batteries and vacuum tubes, meters and test equipment, oscilloscopes of various types for calibrating and adjusting radio and other equipment, meteorological equipment and supplies, and photographic equipment and supplies.

The entire program, General Akin said, will include some 200 items of communication - electronic equipment, but those listed are the principal ones.

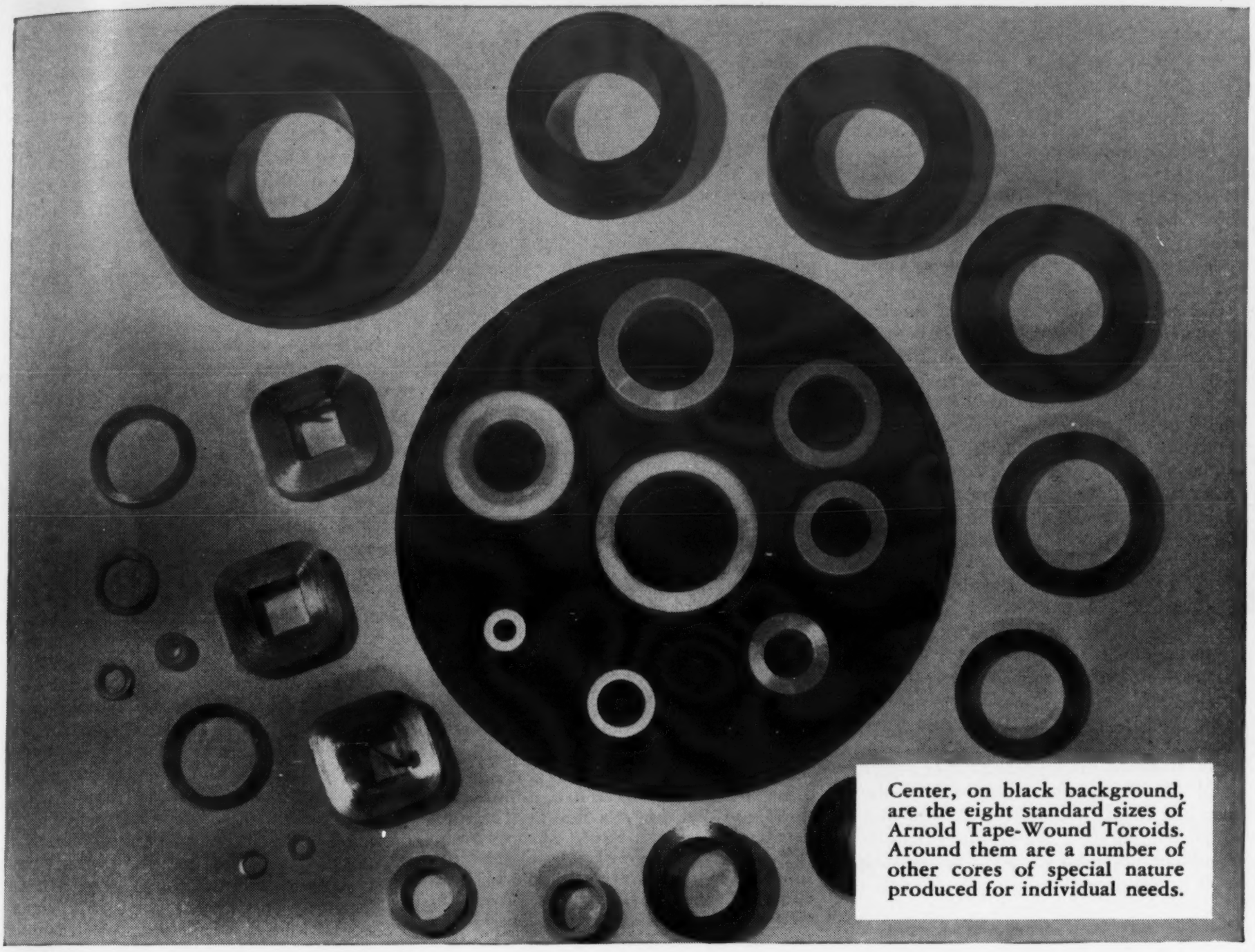
Disaster Communications Service

NSRB and Military Submissions Delayed

Delay in submission of comments on FCC's proposed Disaster Communications Service by the Department of Defense, the National Security Resources Board and other vital government agencies appear to indicate that while the Sept. 15 deadline for submitting comments had passed, the Commission may extend the date for filing, or, in any event, withhold final decision on the proposed rules until the outstanding comments have been received. Registered with the FCC before Sept. 15 were letters of approval and suggestion from several leading organizations and numerous amateur operators.

The proposed rules and the overall concept were endorsed by the American Radio Relay League in its comments. The ARRL, however, asked consideration by the FCC of the establishment of a fifth telephone channel instead of seven of the proposed c. w. (continuous wave telegraphy) channels. The League said it is its opinion that licenses in the disaster service, particularly those who are not amateurs, will choose voice communication primarily if not exclusively, as a result of their using voice on their own regularly assigned frequencies.

"This, it seems to us," the ARRL stated, "will dictate that amateur use also will have to be largely with (telephone) emission in order to accomplish the purposes of liaison. Conversely,



Center, on black background, are the eight standard sizes of Arnold Tape-Wound Toroids. Around them are a number of other cores of special nature produced for individual needs.

ARNOLD TAPE-WOUND TOROIDAL CORES

of DELTAMAX 4-79 MO-PERMALLOY SUPERMALLOY*

APPLICATIONS

MAGNETIC AMPLIFIERS
PULSE TRANSFORMERS
NON-LINEAR RETARD COILS and TRANSFORMERS
PEAKING STRIPS, and many other specialized applications.

RANGE OF SIZES

Arnold Tape-Wound Toroids are available in eight sizes of standard cores—all furnished encased in molded nylon containers, and ranging in size from ½" to 2½" I.D., ¾" to 3" O.D., and ⅛" to ½" high.

RANGE OF TYPES

These standard core sizes are available in each of the three magnetic materials named, made from either .004", .002" or .001" tape, as required.

In addition to the standard toroids described at left, Arnold Tape-Wound Cores are available in special sizes manufactured to meet your requirements—toroidal, rectangular or square. Toroidal cores are supplied in protective cases.

**Manufactured under licensing arrangements with Western Electric Company.*

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General Office & Plant: Marengo, Illinois

there will be comparatively little use of c. w." It added, "Although realizing it means a reduction in the total number of available channels, the League believes that for the reasons stated above there is no alternative but to suggest that a fifth voice channel be added by deleting seven of the presently-proposed c. w. channels."

Discussing general technical specifications for equipment, the ARRL said it believes that the proposal requires a degree of carrier stability beyond that consistent with the nature of the service. In addition, it was pointed out, amateurs buy equipment with their own funds, and cost can be a considerable factor in the amount of amateur participation in the service. The comments were filed by General Counsel Paul M. Segal and ARRL Secretary L. Budlong.

In generally lauding the proposal, the National Association of Taxicab Owners and Cab Research Bureau, Inc., suggested that the proposed rules be amended to specifically make eligible for the service the huge army of taxicab radio operators, and to make some allowance so that the cab radio stations, licensed in the 52-157 megacycle band, could operate in the 1.7-1.8 mc specified band. The comments further suggested that "Some authorization should be provided whereby the taxicab service could participate in any drills or mock tests conducted by Civilian Defense and similar organizations during times when there is no actual emergency or disaster."

A letter to the FCC from Secretary of Agriculture Charles Brannan stated that the Department of Agriculture's forest radio service would be made available in disasters "involving loss of communications facilities normally available," but added that the Department "does not anticipate that it will operate any radio stations in the proposed Disaster Communications Service." While the Department of Justice's Federal Bureau of Investigation notified the Commission that it would definitely not make use of the proposed service, the same Department's Immigration and Naturalization Service filed comments to the effect that the radio equipment in use along the Mexican border would be available if needed, but stated that, in calling for more tolerance than the .005% proposed for frequencies, "specifications for equipment to operate in the service are more rigid than is justified in view of the limited operations."

One of the numerous individual amateurs filing comments, Roger M. Wilson, of Washington, D. C., cited his 20 years experience as a licensed amateur and opined that the Commission should "add provisions to the proposed rules that will permit utilization of existing equipment, especially amateur mobile equipment, including a suitable band of frequencies, a realistic frequency tolerance that can be complied with by simple means, and technical standards and equipment requirements in line with the simple nature of the equipment concerned." Radio broadcasters WPAL, Charleston, S. C., WCPO, Cincinnati, Ohio, KSWM, Joplin, Mo., and the Supreme Broadcasting Co., New Orleans, La., and several others filed favorable comments and notified the Commission that their broadcasting facilities would be available for disaster communications use.

Also submitting approval for the proposed service were the State Department, represented by Capt. John S. Cross, acting chief of the telecommunications policy staff, who suggested that Voice of Aerica station could fit into disaster communications plans; Andrew C. Ivy, M.D., Deputy Director of Chicago Medical Defense, who requested additional frequencies; President Albert W. Schoettlin of the Tri-State Amateur Radio Society (Illinois-perhaps the remote pickup units of the Kentucky-Indiana); and President Herbert A. Friede of the Eastern Association of Fire Chiefs.

Cadet Wilbur J. Jensen of last summer's encampment isn't getting another medal in the above photo. It's the same one he was being presented in our last issue. Same photo. Same commanding general of Fort Monmouth, Major General Francis H. Lanahan on the left. Same Brigadier General C. O. Bickelhaupt presenting the medal.

But this time the communications company with which we associate General Bickelhaupt is different. This time it's the American Telephone and Telegraph Company, of which he is vice president and secretary. And this time we have it correct.

Surprising what one incorrect letter will do. Last issue we had an "I" instead of an "A" in the company's first initial, and we heard about it, frequently.

The reaction to that error had its pleasant side, however. The considerable comment indicates that SIGNAL is *read*, and all the way through at that.

Big Increase In Facsimile Seen

Although the development of facsimile has not approached the visions of its postwar growth which were seen during World War II, its expanded use by the Western Union Telegraph Co., a speedup in military uses resulting from the Korean situation, and development of weather raporting networks all presage sharp increases in employment of facsimile during the next few years, the Wall Street Journal reported in a roundup on the subject.

The article reported that Western Union now has more than 2000 Desk-Fax units in operation, with 3000 more being manufactured including 1000 for government agencies and embassies in Washington. Nine more vehicles also are being equipped in the Baltimore telecar experiments, it was said.

More than 1000 units produced by the New York Times Facsimile Corp. are in use, 200 in a weather map service for the Air Force and commercial airlines and 350 handling news pictures for the Associated Press. Hogan Laboratories, Inc., of New York, headed by John V. L. Hogan, a facsimile pioneer, is shipping units south to serve in a weather reporting network for cotton planters, it was brought out. Alden Products Co. of Brockton, Mass., will market, beginning in January, sets designed primarily to carry orders from factory offices to production lines, shipping rooms and other parts of factories, the article added.

Telephone Warning System

A nation-wide, direct-line telephone network designed to alert the entire United States immediately in the event of hostile air attck or other national emergency has been completed. The system, composed on 146 key points manned by civilian defense organizations throughout the country, which will warn their local areas of any possible danger, was established and operationally engineered by the Long Lines Department of the American Telephone and Telegraph Co.

General Tel Defense Program Set

The operating telephone companies in the General Telephone System, the largest group of Independent telephone companies, which have a notable record of excellent efficiency and management, on an individual company basis have all established in a spirit of full preparedness their activities and programs to meet the demands and tasks

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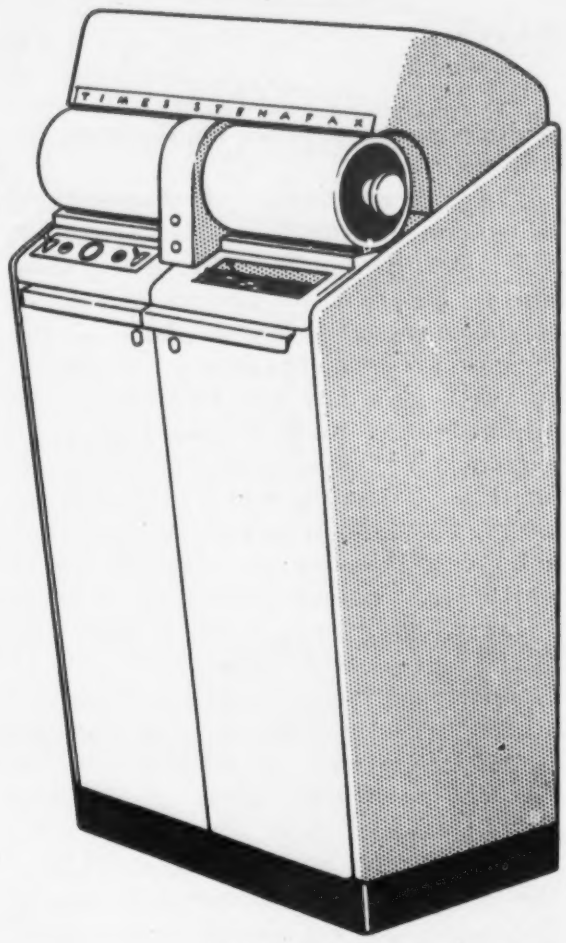
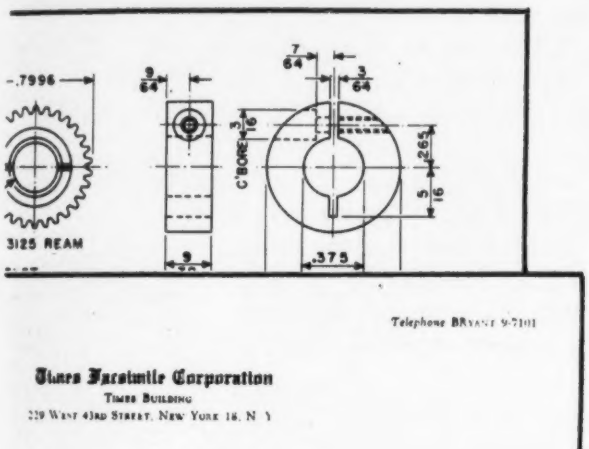
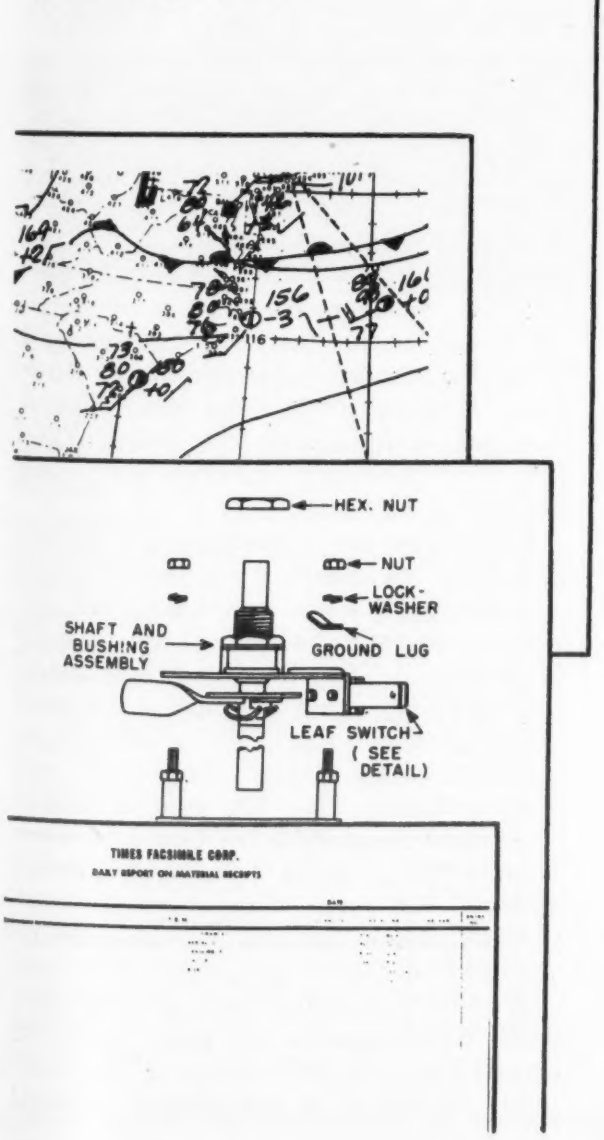


STYLED BY HENRY DREYFUSS



ENGINEERING DRAWINGS



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Electronics does the trick! Light, scanning the original copy mounted on a cylinder, passes through a photocell which activates a stylus poised over the stencil mounted on a second cylinder. The complete operation takes only *six* minutes. Clear, clean copies can be made on any standard mimeograph machine.

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of the national defense mobilization requirements.

The top executives of the General Telephone Corp., parent company in New York, have engaged in discussions and deliberations on various exigencies of the national defense plans of the various affilated operating companies but each company has had broad and full discretion to formulate and set in motion their operations and use of facilities to meet every requirement arising from the armed services, civilian defense authorities and the industries which are called upon to produce military equipment and supplies in their respective territories.

Since the Pacific Coast has been and is the main springboard for the implementing of the United States forces, fighting in Korea, both in material and personnel, the largest General Telephone System operating subsidiary, the Associated Telephone Co. Ltd. of Santa Monica, Ca., which serves a substantial and important area of Southern California, has bulked most significantly in the stepped-up defense mobilization picture. That this strategic role of the company was early recognized by the Associate company's management was exemplified by the issuance in mid-August of a comprehensive and all-inclusive manual, "Mobilization and Security Plan," which was distributed to all employees.

First In REA Phone Program

In contrast to the electric power program of the Rural Electrification Administration—in which no one knew the identity of the first farmer to receive REA-financed electric service—the starting point of the REA telephone program was plainly staked out Sept. 20, in ceremonies at Fredericksburg, Va.

Commemoration exercises which included a three-mile-long parade, a call from President Truman at the White House to Eugene Dickinson, the first subscriber of a small Independent, the Fredericksburg & Wilderness Telephone Co., to receive new service during the current REA-financed dial cutover, and a drawing among the Independent's 170 subscribers for five free toll calls, marked the first installation of telephone facilities put into service through an REA loan.

The company, in a rural territory outside of Fredericksburg—the town itself is served by the Chesapeake & Potomac Telephone Co.—has installed an unattended dial switching station to provide dial service for its previous subscribers and a few who have been added thus far during the dial changeover. New lines must be constructed to serve 140 more subscribers who, it is estimated, can be added through the remainder of the $55,000 loan.

As part of the change in service, which included approval by the Virginia Corporation Commission of a rate increase from the previous $1.50 monthly to $3, Fredericksburg & Wilderness subscribers now can call Fredericksburg without paying the previous 10-cent toll charge. Through an operator assistance arrangement, C. & P. operators in Fredericksburg will handle toll, information, and intercept calls.

At the ceremonies, held in conjunction with the annual Fredericksburg agricultural fair, REA Administrator Claude Wickard and officials of the REA borrower praised the cooperation of C. & P. About 1000 persons were present at the fairgrounds ceremonies to hear the President's call broadcast over loudspeakers. The National Broadcasting Co. made films for television, and the White House call was recorded for network broadcast use.

President Thomas E. Thorburn of the Independent said that initially stock had been sold to 60-odd shareholders to finance some improvement of the company's facilities, which handled 170 subscribers on 10 lines, ranging up to one 26-party line. It was decided, he pointed out, that complete renovation would be necessary. Indications were that the company management had made preliminary arrangements for a bank loan, but had anticipated difficulty in repaying it, and that the availability of long-term, low-interest government money through REA had made the dial cutover and projected service extension more feasible. Equipment for the dial conversion was supplied by the North Electric Co., Graybar Electric Co., and Stromberg-Carlson Co.

In his informal conversation with Mr. and Mrs. Dickinson, President Truman commented that he had telephone service at one time with a large number of parties on the line, and had found difficulty in getting the line or in hearing what was said when he did get it, because of the large number of persons listening in. He said it would be almost impossible to run a modern farm without good telephone service, adding that farm telephones are particularly important now, because of the national defense program. The nation's chief executive forecast that hundreds of thousands of farms would be served through REA-financed facilities.

Mr. Wickard, in his address, pointed

Communications Text In Civil Defense Report

The text of the section entitled "Communications" in the plan for organizing the civil defense of the United States, prepared by the National Security Resources Board and transmitted to Congress Sept. 18, was as follows:

The nerve system of civil defense is communications. Effective and rapid communications must be maintained between federal and state and between state and local civil-defense organizations and within these organizations if they are to function when needed. Even though our existing communications systems are efficient, in wartime they can be severely damaged in areas under heavy attack. Therefore, every contingency must be provided for, and sound, flexible plans developed so that in any emergency, communications in some form will be available.

In formulating communications plans each state and local civil-defense organization should take the following steps:

1. Identify the communications needs that would exist in the event of an emergency, and anticipate the volume and kind of traffic and the special problems that might arise.

2. Inventory existing communications facilities and make such arrangements as may be necessary for their emergency use in accordance with the anticipated requirements.

3. Provide in every instance secondary systems of communications in the event the primary system is made unavailable or inoperative in the emergency.

In each state area, metropolitan area, or community, communication needs will vary, depending on the degree of vulnerability, geographic location, size, and required extent of civil-defense operations.

Normally, communications requirements in critical target areas would include facilities for: communication between civil-defense control centers, air-raid warning networks, communications systems at local level for transportation, fire, police, rescue, warden, medical, and engineering services; air-ground communications systems at state control centers for use with aircraft employed in civil-defense activities; and communications at all levels to the public.

Communications plants at the local level should embrace all forms of communication including telephone, telegraph, facsimile, AM, FM, and TV, radio, teletype, messenger service, and other emergency communications means. Planning also should include provisions for radio equipment for communication between ground stations and between air and ground. All existing communications facilities and services should be used to their fullest extent, but provision must be made for emergency services as alternate means of transmitting messages when regular facilities are destroyed. Such emergency services should include mobile two-way radio equipment, amateur radio services, and any other means that could be developed.

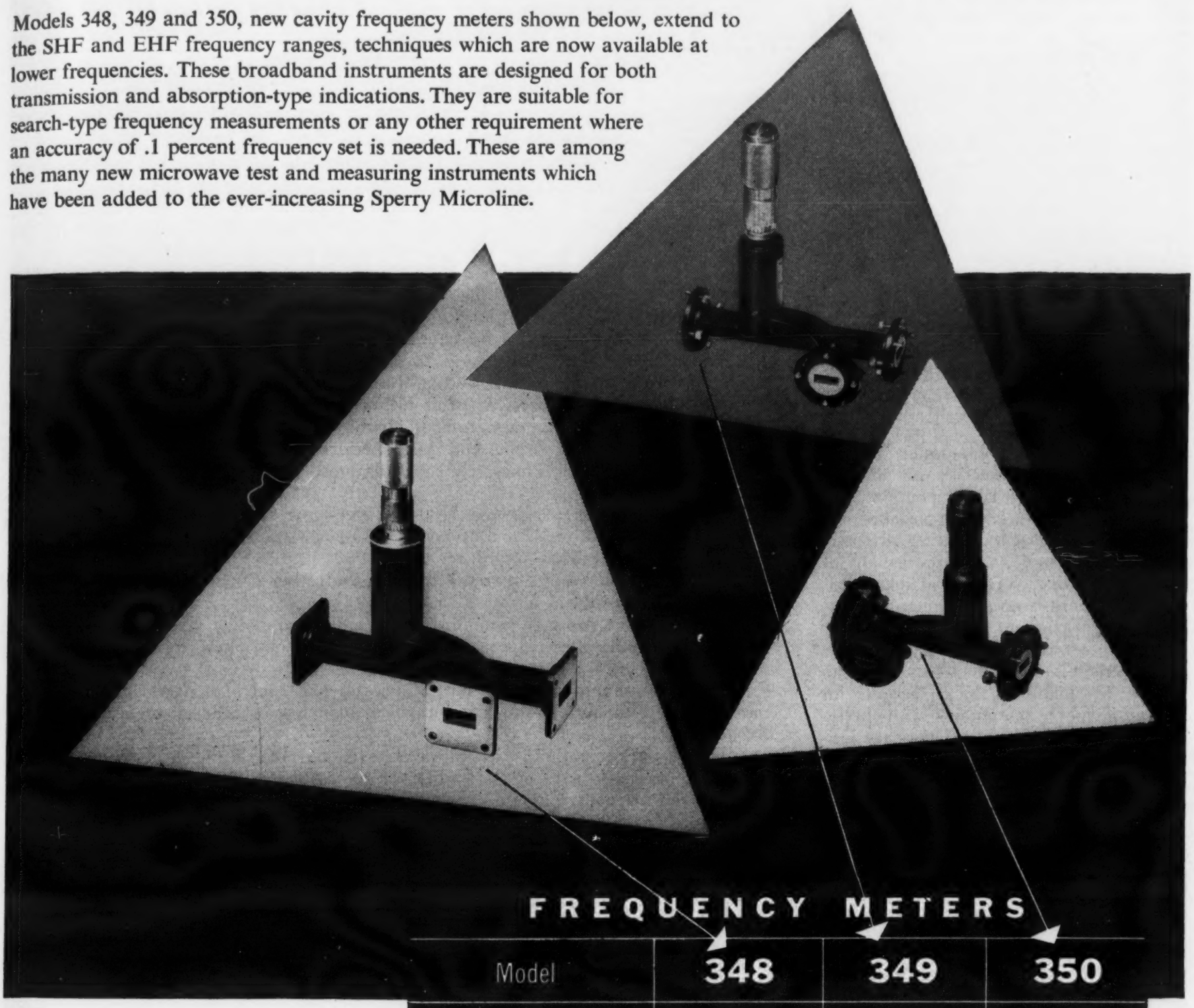
To the extent that existing facilities have to be augmented with additional

(*Continued on page* 48)

New Instruments for Microwave Testing

COMPLEMENT SPERRY'S *Microline**

Models 348, 349 and 350, new cavity frequency meters shown below, extend to the SHF and EHF frequency ranges, techniques which are now available at lower frequencies. These broadband instruments are designed for both transmission and absorption-type indications. They are suitable for search-type frequency measurements or any other requirement where an accuracy of .1 percent frequency set is needed. These are among the many new microwave test and measuring instruments which have been added to the ever-increasing Sperry Microline.



FREQUENCY METERS

Model	348	349	350
Description	CAVITY	CAVITY	CAVITY
Frequency Range mc	13,000-18,000	19,000-26,000	26,500-39,000
Absolute Accuracy	1 1000	1 1000	1 1000
Approximate Loaded Q	1000	450	1000
Fittings R-F	UG-419 U	UG-425 U	UG-381 U
Fittings Video	UG-419 U	UHF	UG-381 U

Other new instruments in the frequency ranges of the above mentioned meters are:

Instrument	Model	Frequency Range mc
Impedance Meter	320	18,000-26,500
Impedance Meter	346	26,500-40,000
Impedance Transformer	347	26,500-40,000
Directional Coupler	405	26,500-39,000
Directional Coupler	413	18,000-26,500
Directional Coupler	415	18,000-26,500
Directional Coupler	388	12,400-17,000
Directional Coupler	429	32,000-39,000
Short	371	26,500-40,000
Short	372	12,400-18,000
Termination	401	12,400-18,000
Termination	402	26,500-40,000
Detector and Mixer	357	12,400-18,000
Detector and Mixer	358	18,000-26,500
Detector and Mixer	359	26,500-40,000
Detector and Mixer	382	26,500-40,000
Magic Tee	390	18,000-26,500
Magic Tee	391	26,500-40,000

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out the advances in rural mail delivery, roads, and electric power, adding that "Yet here at the halfway mark of the 20th century more than half of our farmers still do not have telephones. The number of farm telephones in this country is no greater than it was in 1920. And the quality of farm telephone service in most areas is much poorer than it was 30 years ago."

The REA Administrator declared, "There have been several reasons for rural telephone service lagging behind other rural improvements. Most important were the high costs associated with rural telephone service and the lack of lowcost financing available to thousands of Independent telephone companies and mutuals which would have liked to modernize and extend their service.

"It was in recognition of this situation and of the need of farm people that resulted in the enactment by the Congress last October of an amendment to the Rural Electrification Act. This legislation made it possible for REA to undertake its lending program for the expansion and improvement of rural telephone service. Under this program, there is no government ownership or government operation of any telephone service. This program merely extends a helping hand to local initiative by loans to local people for bringing more telephones and better service to farm people. These are lowcost loans to be repaid over a 35-year period—not grants or gifts."

U. S. Korean Circuits Delayed

Cable & Wireless Ltd. Appear In

Cable and Wireless Ltd. might possibly gain a head start on the U. S. radiotelegraph carrier in establishing a mobile wireless telegraph unit in Korea if its hopes of having its station and crew of engineers and operators flown to the theater and of having the station in operations by mid-October materialize.

The three American radiotelegraph companies — RCA Communications, Mackay Radio and Telegraph Co. and Press Wireless—have all encountered governmental red tape difficulties in getting their employees completely cleared for entrance into the Korean theater, together with the shipment of the equipment into the country, since they originally planned to set up the units in Korea last July.

At present the outlook for the U. S. companies is that with the clearing up of the entry approval of their personnel their stations will not be able to start service for a month or six weeks. The shipping of the equipment is by steamer in the case of all the American carriers and their personnel also are slated to go largely by steamer.

RCA Communications, which before the North Korean Communist invasion operated the only U. S. direct radiotelegraph circuit from Seoul, had already shipped its equipment by steamer from New York which was to pick up a diesel generator at San Francisco and two members of the crew of 16 operators and technicians, headed by Henry A. Mortara of the San Francisco office who managed RCA mobile stations in Europe during World War II. The 14 other members of the unit will probably fly to Japan later.

Mackay Radio arranged to send a crew of seven operators and two engineers from its Philippines station to Manila, together with the equipment, with A. O. Adams as the manager of the unit. Press Wireless was prepared to ship its equipment by steamer from San Francisco with a crew of eight operators and engineers. Prewi Washington manager Albert McGeagh is slated to head the unit.

No RTMA Color TV Decision

The Radio-Television Manufacturers Association cannot decide for its members whether they will produce television receivers with bracket standards, making them capable of being adapted to receive any color TV system in black-and-white, the RTMA board of directors informed the FCC Sept. 20. Under the terms of the Commission's color video report, manufacturers are to inform the FCC by this coming Friday, Sept. 29, as to whether they will build such sets.

Citing that the FCC report suggested that the Commission may have believed RTMA would act as a group, the association said it has never attempted to, and cannot, require its members to build or refrain from building any particular set. "So far as this association is concerned," the letter signed by RTMA President Robert C. Sprague declared, "the decision whether to build sets incorporating bracket standards must be left to the individual determination of each manufacturer.

It was understood that, in addition to other reasons for the RTMA not speaking for its entire membership on the subject, it was felt that the set makers would leave themselves open to antitrust action if they responded in concert to the FCC report.

The RTMA directors also adopted

Civil Defense Communications Text—Continued

equipment and supplies, local civil-defense organizations in cooperation with the state civil-defense agency should develop an itemized list of requirements, and these requirements should be reviewed, coordinated, and consolidated by the state organization for submission to the federal civil-defense agency, when requested.

Control Center Communications:

Civil-defense control centers are essentially centers of communications for the receipt of attack warnings and other information and for the initiation, direction, and control of civil-defense operations during an emergency with due regard for requirements of military security.

The state civil-defense control centers should be located with special regard to security, the availability of communications and transportation.

Each local civil-defense control center should similarly be located with due regard to security and ready availability of all kinds of communications facili ties and to local civil-defense services. Secondary communication services should likewise be available to insure communications during any emergency.

Alternate control centers should be planned for interconnection with the primary control center for operation during alert periods and in the event the pimary control center should be knocked out.

Every effort should be made to keep the communications equipment of local control centers as simple as possible. However, they should be capable of maintaining communications for the following purposes:

(a) Receipt and dissemination of air-raid warning information.

(b) Operation of sirens and public-address systems to alert and convey warning to the public, industrial installations, and to civil-defense volunteer workers.

(c) Summoning of key civil-defense personnel for duty when needed.

(d) Receipt of reports and requests for assistance from established local services and civil-defense operating units.

(e) Maintenance of contact with state and other control centers to facilitate exchange of assistance.

(f) Constant two-way communication with local police, fire, rescue, medical, engineering, and other operating services and with key radio broadcasting services.

Provision should be made in all civil-defense control centers for a force of messengers, with automobiles, motorcycles, bicycles, or other transportation.

Broadcasting:

Broadcasting stations (including television) should be utilized as an important medium to inform the public of its responsibility in civil defense.

For effective civil-defense operations, every person should know what he must do in an emergency. This will involve a major educational program and require a well-integrated system for the dissemination of information.

(*Continued on page* 50)

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Stable Balance at the Highest Gain

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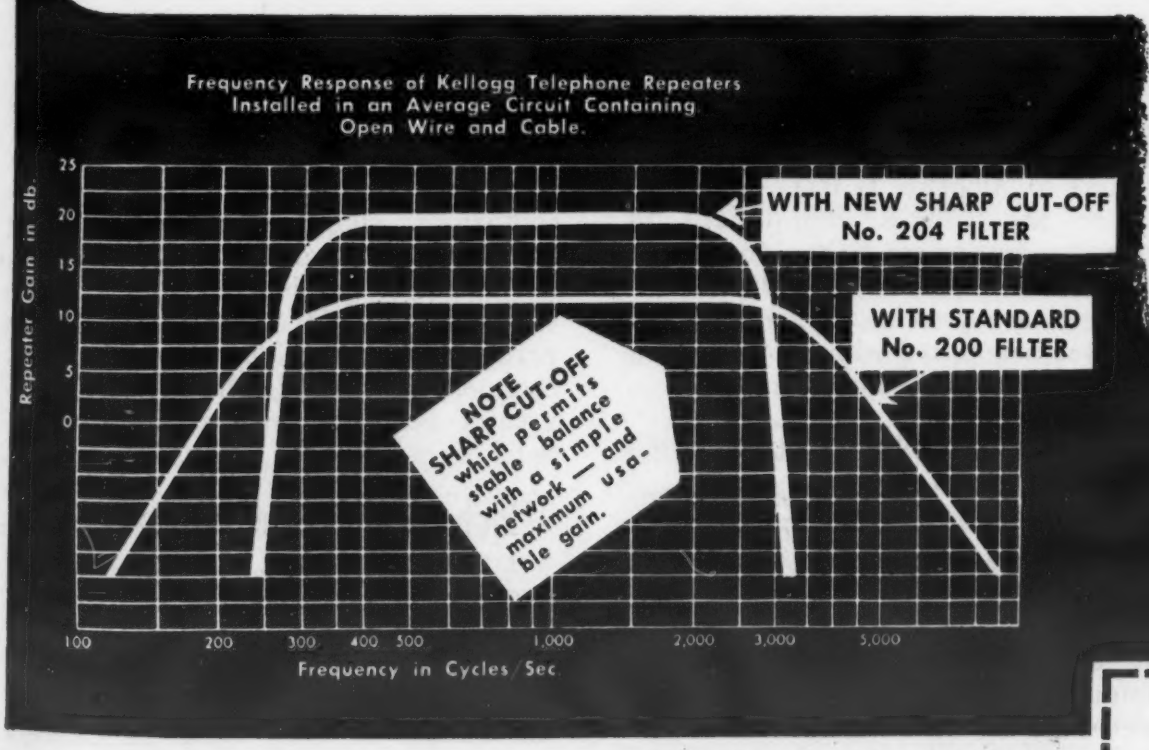
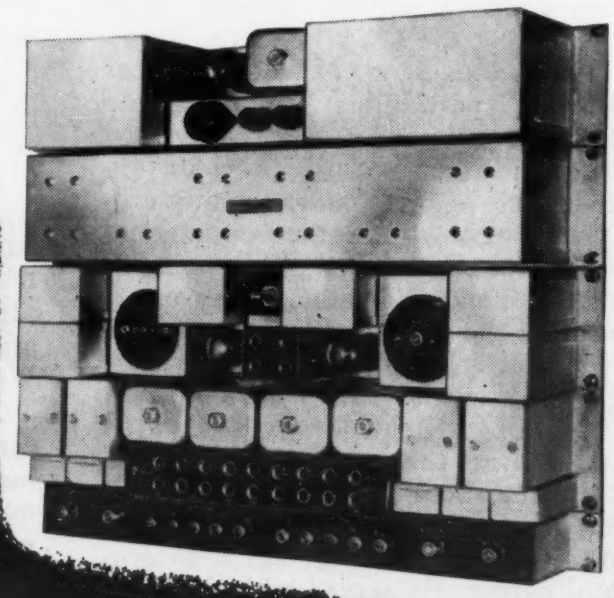
The Improved KELLOGG Repeater Is Your Best Buy!

- **SHARP CUT-OFF FILTER UNIT** — limits the frequency of the band to be passed—permits better balance and greater usable gain. Filter has sharp cut-off characteristics outside the voice band; i.e. below 300 cps and above 2700 cps.
- **FINE ADJUSTMENTS OF RESISTANCE AND CAPACITY**—providing for stable balance at the highest gain, can be obtained in the balancing net with maximum ease. Two continuously variable potentiometers in each net, and a series of small capacity steps, are readily adjustable by hand or screwdriver.
- **GAIN ADJUSTMENTS ARE ACCURATELY CALIBRATED** in 1db steps. Gain obtained is always known without necessity of measurement. Adjustments are easily made from the front of the repeater with a screwdriver.
- **NO HARMONIC DISTORTION OR CROSS-TALK** can be introduced through the power source — it is eliminated by push-pull amplification.
- **OPERATES BELOW MAXIMUM RATINGS**—assuring long, trouble-free life. All components function at conservative values.
- **EASY INSTALLATION AND MAINTENANCE**—Mounts on 19-in. relay rack. No soldering or strapping is required. Test and monitoring jacks provide for checking tubes and repeater operation.
- **UNINTERRUPTED SERVICE**—In the event of power failure physical circuit is automatically cut through. There is no need to turn down circuit during maintenance. The only spare parts required are easily-replaceable vacuum tubes.





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a resolution authorizing a special committee to investigate the feasibility of having a comprehensive study prepared on the technical contributions of the industry in the development of TV and frequency allocation plans. Dr. W. R. G. Baker, director of the RTMA engineering committee, heads the group, and other members are Mr. Sprague and Dr. Allen B. DuMont.

During the Sept. 18-20 RTMA industry meeting in New York, parts manufacturers expressed the view that, with proper channeling and no unnecessary stockpiling, they can meet both civilian and military requirements for electronics components during the remainder of 1950. Capt. Henry Bernstein, USN, director of the Armed Services Electro Standards Agency, spoke to the parts manufacturers on recent revisions in joint Army-Navy specifications for electronic components.

New Chiefs For CAA And CAB

The nomination by President Truman Sept. 19 of Delos W. Rentzel, Civil Aeronautics Administrator, to the Civil Aeronautics Board, where he will undoubtedly become chairman, and the designation of Donald W. Nyrop, now Deputy CAA Administrator, to succeed Mr. Rentzel in the top position at CAA, is regarded as indicating a closer liaison between the two agencies which handle civilian and commercial aviation affairs.

The selection of Mr. Rentzel, who before taking the CAA helm two years ago was president of Aeronautical Radio, Inc., particularly won favorable acclaim from the aviation industry.

Mr. Rentzel, with his previous experience as a pilot and as an aeronautical engineering and communications official, is the first CAB member to have had actual aviation background. Almost all the previous appointees were lawyers. It is also the first time that a CAA top official had been named to the CAB. Mr. Rentzel was designated to take over the unexpired term of former Chairman Joseph J. O'Connell, which runs until Dec. 31, 1953.

Mr. Nyrop has mainly had a governmental career. He served with the CAB for three years, completing his last year there as executive officer to the CAB chairman. During the war, he was executive officer to the assistant chief of staff (Operations) of the Air Transport Command. After the war, he was with the Air Transport Association, specializing in international policy matters, until August 1948, when he became Deputy CAA Administrator.

Civil Defense Communications Text—Continued

Through broadcasting stations, timely civil-defense informational and educational material can be quickly presented a maximum audience with a minimum number of persons required to prepare and disseminate the information. Programs can be broadcast regarding the location of shelters, advice given on how to prevent the jamming of thoroughfares, and similar educational programs carried on for the benefit of the various levels of civil-defense organizations.

Amateur Radio Operators:

Amateur radio operators and networks will be used in civil-defense communications. They are licensed radio operators and their radiotelephone and continuous-wave equipment can be utilized as secondary services thus providing for maximum flexibility. Under an organized plan, amateur radio operators will make an important contribution to civil-defense communications.

Security of Communications:

Security problems will arise in the use of communication channels which may be subject to enemy interception. In this respect radio is particularly vulnerable. All plans for communication systems and procedures must take into account this security factor to avoid unnecessary disclosure of information valuable to an enemy.

Organization:

The federal civil-defense agency is responsible for the over-all planning of communications for civil defense and for coordinating with the Department of Defense, the Federal Communications Commission, and other governmental agencies, and commercial communication and broadcasting networks. It will determine the technical specifications and advise civil-defense organizations on their communications systems.

A communications chief with the necessary staff should be established under the state civil-defense director and made responsible for the necessary surveys, planning and coordination of civil-defense communications within the state, state areas and local areas. The state communications chief should work closely with the commercial companies within the state.

A communications chief should be a part of the local civil-defense organization. He would be responsible for preparing the local communications plan for civil defense. He should assist in determining the location of the local control center or centers, based on the availability of adequate and dependable communications facilities at the selected locations.

To assist in the proper preparation for an emergency, the communications chief at each level should make sure that responsible authorities are familiar with the plans, requirements, and specifications for communications systems and procedures.

Military Leave For Bell Groups

New military leave contracts were signed, the latter part of September, between the New Jersey Bell Telephone Co. and employees of the company in the plant, accounting and commercial departments, represented by the Telephone Workers' Union of New Jersey, an independent union. The contracts, it was learned, carry the same general terms as those for employees of the Illinois Bell Telephone Co., in which the military leave clause agreed to applies to all employees of the company and not only to the Communications Workers of America (CIO).

After the Illinois Bell board of directors authorized the company's management to institute liberalized military leave policies, the new agreement was negotiated with all the unions representing Illinois Bell employees.

Mobile System Chicago Convention

The National Mobile Radio System, undertaking a full-scale drive to build up its membership and gain the strength of unity of purpose among operators of miscellaneous common carrier radiotelephone systems, held its annual convention Oct. 19-21 at the Palmer House in Chicago where the major question taken up was the NMRS reorganization to establish eight regional bodies.

Heading up the list of guest speakers for the convention was Arthur A. Gladstone, chief of the FCC's domestic radio services branch of the common carrier bureau who discussed common problems confronted by the commission and miscellaneous common carriers in establishing the radiotelephone service, and also discussed the anticipated role of the radiotelephone carriers in national defense preparations.

Also of great interest to delegates to the convention was the exposition by representatives of the Federal Telephone & Radio Corp. on results of the company's study of economic and operating problems of the miscellaneous common carriers as well as conclusions determined by Federal's experiments in operation of miscellaneous common carrier facilities aimed at greater economy and stability in the field of radio.

Finch Telecom Being Revitalized

A proposal to change the name of Finch Telecommunications, Inc. to Facsimile and Electronics Corp., together with a recapitalization program, was presented to the Finch stockholders at the annaul meeting Oct.2 at Passaic, N. Y.

Finch Telecommunications went into bankruptcy Nov. 7, 1949, and in the reorganization Casper M. Bower was designated president with Raymond B. Littlefield, partner in the Littlefield & Co. investment firm of Providence, R. I., as board chairman. The financing pro-

posals include an increase of the authorized common stock from 400,000 shares to two million shares, with a reduction in par value from $1 to 25 cents a share, and creation of a new Class A stock of 400,000 shares with $1 par value.

Police Communicators Conference

Resolutions having important bearing on the Police Radio Service as well as other mobile radio fields which were submitted at the 16th annual conference of Associated Police Communications Officers Inc. in Cleveland at the end of August are expected to be adopted and released within the next several weeks.

Highlights of the well-attended meeting, at which Col. Edwin L. White, Chief of the Safety and Special Radio Services Bureau of the FCC, has stated was prevalent an "excellent spirit of cooperation despite diversified opin ions" between the police communicators from various sections of the United States, included the election of Zellon Audritsh as president of the association for the ensuing year, elaborate displays by leading mobile radio manufacturers, and speeches by Dr. William E. Warner, Ohio executive director of civilian defense, Dr. Daniel Noble, of Motorola, Inc., and Cleveland Mayor Thomas A. Burke. FCC spokesmen labeled the convention "a very successful meeting."

MARS Membership Jumps

Membership in the Military Amateur Radio System mushroomed during fiscal year 1950 from 850 members on July 1, 1949 to 3,122 members on June 30, 1950.

Captain E. L. Nielsen, Signal Corps, chief of MARS-Army, reports an increase from 600 members to 1,770 while figures from the office of his Air Force conterpart, Major R. H. Ralls, show a corresponding jump from 250 members to 1,352.

MARS was created in November, 1948 by joint Army-Air Force regulation to coordinate practices and procedures af amateur radio operations with those of military radio communications, and to provide an additional source of trained radio communications personnel in the event of local or national emergency. The system, joint for determination of policy but separate for operational control, follows service channels of command for administration.

MARS members may be found wherever there are U. S. troops today. Membership is open to any individual affiliated with the military, whether on active duty or a member of the civilian components, provided he is a licensed radio amateur.

Bell Lab V. P.'s With Air Force

The leading experts of the Bell System, as in World War II, are in great demand for key posts in the present national defense preparedness drive. Two top executives of the Bell Telephone Laboratories who have outsearch and developments were named standing reputations in the field of re- Sept. 25 by General Hoyt Vandenberg, Air Force Chief of Staff, to key scientific posts in the Air Research and Development Command.

They are Dr. Merwin J. Kelly, executive vice president of the laboratories since 1944, who was appointed technical advisor of the new command, and Donald Quarles, laboratories vice president and formerly director of transmission development and apparatus development, as management advisor of the command. Dr. Kelly has been with the Bell System in research since 1919 and Mr. Quarles, who is the chairman of the Defense Department's Research and Development Board's electronics committee, has likewise long Bell System service.

General Harrison also drew from the Bell System for a staff assistant in the field of planning and controls for the NPA's with the appointment of Nathaniel Knowles, who served with the Bell Telephone Co. of Pennslyvania for 12 years before the war and then was associated with Gen. Harrison in the OPM and in the Army service forces. In the Army, where he held the rank of colonel, Mr. Knowles received the Legion of Merit for the development of the Army supply control plan.

It is also understood that the chairmanship of the Economic Stabilization Agency, to which Dr. Alan Valentine was appointed October 7th, was first urged on Chester Barnard, president of the New Jersey Bell Telephone Co., who refused.

Western Union Has Gain for '50

War Brings Sharp Increase

In the first full month following the sending of United States troops into Korea, and the start of the buildup of preparedness activites and the resulting effect on business activity, the Western Union Telegraph Co. recorded an increase in gross revenues of more than $1.2 million over a year ago, and a net income of $528,091, the company reported September 11.

Western Union's report for July 1950, showed gross operating revenues of $15,441,901, against $14,223,336, in the same month a year ago.

Prior to July the telegraph company for some time generally had recorded gross operating revenues totals smaller than those for the comparable months a year previous. In the months when net income was reported, it was attributed to rigid control of expenses and operating economies resulting from mechanization.

For the first seven months of 1950, Western Union has a net income of $3,734,391, after provision of $560,000 for income taxes, based on tax rates now in effect. The figure compares with a net loss of $5,091,795 for the same period of 1949.

Included in the net for the 1950 period was $919,798 in non-recurring credits, such as gains from sale of real estate, and in connection with bond maturities and adjustment of foreign tax accruals.

During the January-July period of 1950, the telegraph company recorded gross operating revenues of $103,925,808 contrasted with $104,811,403 in the same period of 1949.

New Western Union Bank System

A private line teleprinter system developed and engineered by the Western Union Telegraph Co., and described as the largest and most modern of its kind in the world, will connect 188 banks in 54 key cities by Dec. 4, it was announced Sept. 13. Service for 142 banks in 36 cities will be cut over Nov. 1, with the remainder of the system to be in operation by the Dec .4 date.

To expedite banking transactions throughout the country, Western Union developed a system which comprises, in addition to the high speed teleprinters and selectors on the premises of the banks, five push-button switching centers set up specifically for the "Bank

Wire." The switching centers are located in San Francisco, Dallas, Chicago, Atlanta, and New York.

Banks which are members of the system range in location from Boston to Jacksonville to San Antonio to Los Angeles. The system has been in the process of construction for the past 18 months. It will not be restricted to the 54 cities, but will be expanded whenever warranted as equipment and facilities are obtainable.

The announcement pointed out that typists can operate the teleprinters on the premises of the banks, and that the confidential nature of the communications has been assured by arrangements with Western Union to operate and maintain the switching centers entirely with telegraph company employees. Regardless of the number of banks in the system, it was brought out, each will receive its own messages without any access to those of the other banks.

Western Union Copy Fee OK'd

New tariffs of the Western Union Telegraph Co. providing for a charge of 10 cents for supplying a confirmation copy of messages filed by transmission by telephone are to become effective Sept. 21. The charge does not apply to confirmation copies of messages delivered by telephone, nor to copies of international messages telephoned for transmission in the gateway cities of New York, Washington, and San Francisco.

Western Union explained in its filing with the FCC that its average cost of preparing and delivering confirmation copies is 11.687 cents per copy. Its practice in the past, when no charge was made for the copies, was not to encourage customers' requests for copies, but it was pointed out that some customers have a legitimate need for the message duplicates.

Color TV Decision Dispraised

Sarnoff States RCA Objections

Brigadier General David Sarnoff, chairman of the board of Radio Corporation of America, in a recent statement voiced RCA's objections to the action of the Federal Communications Commission in adopting the CBS color television system, and to the reasons the FCC has given for its decision.

"We regard this decision," the General said, "as scientifically unsound and against the public interest. No incompatible system is good enough for the American public. The hundreds of millions of dollars that present set owners would have to spend and that future set owners would have to pay to obtain a degraded picture with an incompatible system reduces today's order to an absurdity.

"When we were asked to comment on the First Report of the Commission issued on September 1, we said: 'Never before has an administrative body of the United States undertaken to coerce the freedom of choice of American manufacturers in what they may build and sell under threat, if they do not obey, drastic consequences to the public will follow.' That threat has today been carried out," said General Sarnoff.

"Because the engineers of substantially the entire industry had the courage to disagree with the Commission's impractical proposal," he continued, "the FCC has adopted this incompatible system just as it threatened to do."

"RCA continues to maintain its position that the public interest can only be served by the adoption of standards which provide for a color television system which is fully compatible with existing sets; that is a system which requires no changes whatever in existing sets and involves no expense to the present owners of television sets.

"Regardless of what anyone else may feel called upon to do," General Sarnoff stated, "RCA will continue its efforts to advance the bedrock principles on which the sound future of color television can be built and will be built. Black-and-white television was only a dream yesterday, yet ten million television sets will be in use by the end of this year, and the American people are now buying them at a rate of 800,000 a month. The tremendous technical advances in black-and-white television are the result of practical research, sound engineering, and the industry's demonstrated desire to give the best television to the people at constantly reduced prices."

"Ham"—Red Cross Exercise

Networks of amateur radio stations demonstrated disaster communications plans for the American Red Cross in a nation-wide test October 14 and 15. The annual simulated-emergency exercise was sponsored jointly by the Red Cross and the American Radio Relay League, national association of amateur radiomen.

Local ARRL Emergency Coordinators throughout the country set up emergency tests similar to those likely to be encountered in actual emergencies—floods, fires, hurricanes . . . and atomic attack. Generally, individual amateurs participating in the tests had no knowledge of the plans or the part they were to play until alerted by the coordinator. They manned fixed, portable and mobile stations, setting up an efficient communications network on their shortwave bands to supply contact with the disaster scene and coordinate operations with other agencies throughout the area.

F. E. Handy, ARRL communications manager, noted that transmission of messages closely paralleled the procedure used in actual communications emergencies. Emphasizing the nationwide importance of these tests, Mr. Handy pointed out that the recently-released National Security Resources Board plan for organizing the civil defense of the United States stated that "amateur radio operators will make an important contribution to civil-defense communications."

Radio Amateurs, who have contributed immeasurably to the communications world since the early 1900s, took part in these tests to gain experience so that they will be better prepared to cope with actual emergencies—emergencies such as the California forest fires of several weeks ago, the Winnipeg (Canada) flood, the South Amboy explosion and countless other incidents in which amateur operators were called upon to establish communications circuits when the regular ones failed.

First NPA Orders — Continued from page 40

government agency—key jobs unfilled, facilities limited, organization lines not clear—in an atmosphere reminiscent of the pre-World War II period in the sudden establishment of score of defense agencies.

In the transfer of a number of industry divisions of the Department of Commerce to NPA, the transportation and communications division was not included. An NPA spokesman explained that communications equipment would be included in the "end product" aspect of NPA operations, and that the transfer of the transportation and communications division had been held up pending clarification of the place of the communications operating and manufacturing industries in the NPA structure.

The order, announced Sept. 18, the first to be issued by General Harrison's office, limits to "a practicable minimum working inventory" the quantities of various ferrous and non-ferrous metals and materials, and forest products that can be ordered, received, or delivered. Stockpiling of strategic materials authorized by the Stockpiling Act of 1946 was not involved in the order.

Announcing the order, General Harrison said its purpose was "To make clear the national interest demands there be no accumulation of materials beyond what is needed for immediate production, and that it is the responsibility of both the purchaser and supplier to assure that the spirit of the order is lived up to." The NPA administrator stressed "This will require the most exacting review of inventories and ordering procedures at all levels to insure that the materials available actually produce the maximum volume of goods and services." He added that a "practicable minimum working inventory" is defined in the inventory control regulation as the "smallest quantity of material from which a person can

(*Continued on page* 54)

New RCA overseas teleprinter service by radio, first open to the public, now links New York and Holland.

Now "Flying Stenographers" span the sea!

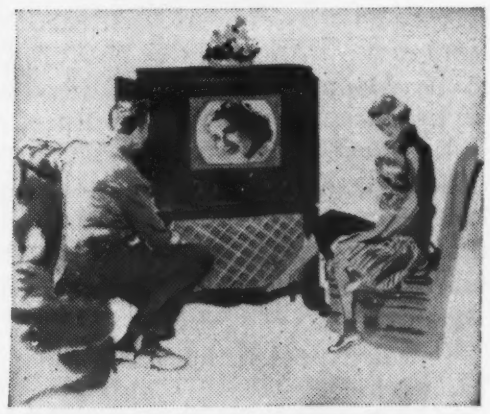
You are familiar with *teleprinter* service which delivers a typed message, by wire, at high speed. Now this useful service takes to the air on a person-to-person basis, and is spanning the Atlantic Ocean by radio!

This new achievement, called TEX, was developed by RCA engineers and European experts. Its heart is an amazing machine that thinks in code, detects errors which may have come from fading or static—and automatically insists on a correction!

If, when RCA's "TEX" is at work, a letter becomes distorted, the receiving instrument rejects the character and sends back a "Repeat, please" signal in fractions of a second—then repeats it until a correct signal is received. Like other RCA advances in radio, television, and electronics, RCA's TEX system helps make radio waves more useful to all of us—and in more ways!

* * *

See the newest in radio, television, and electronics at RCA Exhibition Hall, 36 West 49th St., N. Y. Radio Corporation of America, Radio City, New York 20, N. Y.



RCA Research and pioneering provide a basis for the superiority of RCA Victor television receivers—the best buy on the 1950 market.

RADIO CORPORATION of AMERICA

World Leader in Radio — First in Television

reasonably meet his deliveries of or supply his services on the basis of his currently scheduled method and rate of operation."

While the order does not provide for disposal of excess inventory on hand, it was pointed out that under the Defense Production Act authority is provided for the requisition of excesses.

Included among materials to which the order applies were copper (including refined copper, secondary copper and copperbase alloys, alloy plate, sheet and strip, alloy rod, bar and wire, alloy tube and pipe, unalloyed rod, bar and wire, unalloyed tube and pipe, copper wire and wire products and copper and copper-base alloy castings), iron and steel, aluminum, columbium, cobalt, magnesium, nickel, tin, tungsten, and zinc. The order also included rubber materials, textile products, cement and gypsum board, and some chemicals.

NPA, in its initial setup, will have assistant administrators for program determination (broad policies) and industry operations (specific priority, allocation, and inventory controls matters). Offices of civilian requirements, labor production, manpower requirements, and small business will be set up.

Indicative of the broad scope of the NPA's operations and the importance of General Harrison's assignment was the Commerce Department order stipulating that functions of NPA will include "determination of the requirements for materials and commodities needed for defense, civilian, foreign, and all other purposes," and execution of policies and programs to meet those requirements.

Set up to consider all factors relevant to the various requirements, and to recommend action for the production and allocation of defense, civilian and foreign needs, was an advisory committee on priorities administration. General Harrison will serve as chairman of the committee. Members of the group are to be designated from the Department of Defense, Interior, Agriculture, State, Labor, and Treasury, the Commerce Department office of international trade, the Economic Cooperation Administration, the Atomic Energy Commission, and the Housing and Home Finance Agency.

It was expected that the government's early efforts to insure full supplies of materials and equipment for the armed forces, and a fair distribution of the remainder over the civilian economy, would first be largely on a voluntary basis. Expected to come soon, after the inventory controls order, is a requirement that armed services' contracts be given priority. Most observers believed, however, that more specific and stricter controls would be necessitated in the near future.

Indicative of the speed with which the NPA, under General Harrison's direction, was moving ahead to set up its organization and get control of the difficult tasks it is facing was the fact that General Harrison and Commerce Secretary Sawyer had begun meetings with steel industry representatives even before General Harrison was sworn in as NPA administrator.

At the brief swearing-in ceremonies, General Harrison emphasized in response to questions on specific subjects that he had just taken over the new assignment and could not give informed answers at the that time. He pledged that NPA would be set up and functioning "as fast as humanly possible."

Indicating its importance to the nation's economy and the defense effort, copper production was the second basic industry to be considered in the series of meetings between NPA officials, headed by General Harrison, and industry spokesmen. NPA said the meeting was called to "obtain the views of the primary copper producers on the administration of the Defense Production Act as it may apply to their industry." The agency said that recommendations of the copper producers industry advisory committee would be made later regarding priorities and allocations policies and procedures. Representatives of nine of the nation's leading producers are members of the industry committee, and more will be be added later.

General Harrison's leave of absence as I.T.&T. President to enable him to devote full time to his post as National Production Administrator was approved Sept. 13 at a regular meeting of the I.T.&T. board of directors.

Col. Sosthenes Behn, I.T.&T. Board Chairman, declared, "While the loss of the services of General Harrison, even on a temporary basis, places added burdens on the remaining staff, his unquestioned ability to handle the all-important problems in Washington and his experience in government affairs admirably qualify him for the important position to which he has been called."

General Harrison and Secretary Sawyer visited President Truman at the White House for about 15 minutes on Sept. 14, but commented when they left Mr. Truman's office only that they had emphasized their desire to have NPA operating on a full-fledged basis in the immediate future.

NPA Regulation No. 2

As SIGNAL was going to press the second order issued by NPA Administrator Harrison had just been issued. This regulation established a priority system to assure fulfillment of defense orders, and authorized military procurement offices to rate contracts for priority. The rating will be handled as follows:

Defense orders will be identified as DO orders. Contracting officers of the Army, Navy, and Air Force will assign ratings to the contracts which they issue. All outstanding contracts now in effect and all new contracts will be rated, with the exceptions provided for in List A for NPA Regulation No. 2, (plus additional ones, pertaining to construction equipment for use in the ZI, commercial office and supplies, flags, books, etc.).

Contracting officers of the three services will, in most cases, automatically issue rating for contracts already in effect and will notify contractors accordingly. They will assign to prime contractors the right to apply the rating to the sub-contracts. While the rating to contracts already in force will be done automatically by contracting officers, the Munitions Board suggested that present prime contractors should check with contracting offices to make sure that all their defense contracts which are subject to rating are covered.

In addition, subcontractors should begin immediately to identify those of their contracts which are with prime defense producers, who will have authority to extend the ratings to them.

DO-07 for Electronics-Communications

A 2-digit code number will be used with the "DO" desgination in assigning ratings. DO-01 for aircraft, DO-02 for guided missiles, etc. The code for electronics and communicatins equipment will be DO-07.

Prime Contractors to Assign Sub Rate

That the ratings will be assigned to the prime contractors by the contracting offices which issue the contracts is stressed. Subcontractors, however, will be assigned ratings by the prime contractor. Otherwise, the Munitions Board emphasizes, procurement practices are in no way changed. Contracts will be let in the same was that they have in the past, and those seeking contracts will follow the same procedure that they have been following.

MB Electronics Liaison With NPA

Two key representatives of the Munitions Board electronics division, Brig. Gen. E. S. Langmead, MB assistant director of staff and chairman of the inter-service electronics committee, and Capt. W. D. Wilkins, Navy member of the inter-service electronics committee, have been designated to maintain liaison with the National Production Authority on the blueprint for the priorities and allocations of strategic materials for the communications-electronics manufacturing industry in producing equipment for the Signal Corps, Air Force Communications, and the Navy.

At the same time, General Harrison, NPA administrator, announced that among the first important appointments to his staff was the selection of former Col. H. George Wilde, now president of the Lee, Mass., National Bank, who

was Gen. Harrison's wartime executive officer in the Signal Corps procurement and distribution service, as assistant to the NPA administrator.

Specific organization of NPA, as it relates to the requirements of industries such as communications operating and manufacturing, has not yet been established, and it may be some weeks before a clearcut picture of NPA's procedures and organization emerges. The few communications staff members of the Commerce Department's office of industry and commerce have been transferred into NPA, along with personnel of the other industry divisions.

The new vice chairman of the Munitions Board, Roscoe Seybold, retired vice-president of the Westinghouse Electric Corp., was sworn into office September 18. With the resignation of MB chairman Hubert E. Howard, Mr. Seybold became acting chairman of the board.

No NPA Communications Setup Yet

So far there has been no definite setup for the communications-broadcasting services established in the NPA, but Eugene Merrill, former WPB communications division telephone chief and since the war in charge of German civilian communications, who is a likely prospect to head this branch, is now in the administrative division of NPA. He is likely to be designated later for the field in which he has specialized, it is believed.

The NPA also has a paper organization for the radio-electronics manufacturing industry and Donald Parris, who headed that work in the Commerce Department's Industry and Commerce Division, is engaged in that responsibility in the NPA.

Mr. Parris recently was to confer with top officials of the Munitions Board electronics division on the priorities to be granted for electronic and radio components and equipment.

MB Electronics Subcommittees

The Munitions Board's electronics division is moving ahead successfully in tackling the difficult question of blueprinting the need for critical components of a dozen different categories with the establishment of subcommittees on various components, the membership of which were recommended by Chairman Frederick R. Lack (AFCA past president) of the Electronics Equipment Advisory Committee.

On these subcommittees, electronics division chief Marvin Hobbs has assigned deputy chief Thomas Perrot and other officials of the division as government representatives. Two subcommittees—transmitting tubes and rectifiers—are starting a series of intensive surveys of the component requirements of the armed services with meetings commencing this week and running all through October so that the whole blueprint will be ready when the full Electronics Industry Advisory Committee meets in mid-November.

AIR FORCE

Communications Conference Off

The semi-annual conference of the senior communications officers of the Air Force, scheduled for Oct. 24-26 at Maxwell Air Base (Alabama) was called off due to the exigencies of the Far Eastern fighting and the demands of the entire international situation upon the Air Force.

New Air University Staff Course

A communications-electronics staff course will be among those presented by the Air University at Maxwell Field, Montgomery, Alabama, under the new concentrated program there. The training program is designed to meet current requirements for training officers in all phases of command and staff procedure. The communications courses will be given to three classes of three and half months each, with 58 students in attendance, starting next January 8.

Lab Move To Rome NY Finally Set

A controversy over the location of the Air Force electronics laboratory—its move from Eatontown, N. J., to Rome, N. Y.—was finally resolved Sept. 19 after it had been the subject of Congressional consideration since the beginning of this year. The bill authorizing the move was passed by the House and sent to President Truman.

The Air Force, which initiated the transfer, contended that it was needed in the interest of national defense and economy, but New Jersey interests had vigorously opposed the legislation.

Test Piloting by TV Foreseen

Use of television to take the danger out of test piloting of aircraft is now an accomplished fact at the Air Materiel Command Headquarters, Wright-Patterson Air Force Base, Dayton, O., it was announced Sept. 20.

The Air Force Base revealed that two aircraft there have been equipped with television equipment to record instrument panel reaction to maneuvers and "the use of TV to replace test pilots on dangerous flights is entirely practical." In the development of the new technique, the planes are remotely controlled from the ground while being put through their test paces and television cameras record, for ground reception and observation, the effect on the aircraft or the flight pattern. Lear, Inc., and the Philco Corp. are working on the project with engineers of the Air Materiel Command's Equipment Laboratory and Electronic Sub-division.

AACS's New Center At Rhein-Main

(*See photo section, page* 15)

After being more than two years under construction, marked by several work interruptions, a building which is the only military communications center in Europe, designed and built as such, now finally houses the activities of the Air and Airways Communications Service squadron at Rhein-Main Air Base, Frankfurt, Germany.

Designed and planned by Major Richard F. Amann, wing communications officer, and Major Bert L. Harris, in conjunction with AACS, the construction was begun back in April 1948. When the walls were two-thirds up there was a shortage of funds and construction was halted for several months. The building was actually completed last December, but transfer of equipment to the new combined communications center required until this summer to complete.

The new building, with an area of 14,850 square feet, serves as a communications system as well as housing CW point-to-point and teletype operating rooms of the 1945th AACS Squadron which is one of the largest AACS squadrons in the world.

The 61st Base Communications Squadron, of the Air Base Group, under the command of Major Harris, is

responsible for installation, maintenance, and operation of all base communications facilities including telephone exchange, intercommunication system, radio and teletype circuits, serving the wing and attached units.

The cable system is composed of 4908 circuit miles of telephone cables, the equivalent of one telephone line from Frankfurt to Chicago. Through the cable system pass all control, teletype and radio circuits for Rhein-Main.

The communications squadron consists of 6 officers, 48 airmen, 9 DAF civilians, and 59 Germans. During April and May of this year the entire phone system was moved from the terminal building to the new combined communications building under the supervision of Major Harris, Captain Oran Key, and Lieutenant Oliver W. Massie.

Almost all telephone equipment used is made by German concerns to American specifications. All radio and teletype equipment is supplied through regular supply channels.

The present dial exchange was recovered shortly after the end of the war from an underground bombproof factory in Allendorf, dismantled and moved to Rhein-Main. The present switchboard of 6 positions has an interesting history too, being originally installed at Frankfurt Military Post, then Munich Military Post, Kaufbeuren, and finally at Rhein-Main.

The twenty telephone operators are under the jurisdiction of Mr. Robert Geier, and must be completely bi-lingual, with an American accent. All linemen, repairmen, and technicians must also have a command of English technical words.

There are around 4000 operator handled local calls a day, and an estimated 15,000 subscriber dialed calls. Long distance calls are operator handled, except to Wiesbaden, Hanau, and Frankfurt, with a total of more than 200 a day for incoming calls, and 90 to 100 outgoing.

There are 800 separate lines on the base, and it is hoped that within the next few months there will be 1200 lines, using a four-number dial instead of three. Each operator handles an average of one call a minute. Commercials standards require only one call for every minute and a half.

The communications squadron hopes, in the near future, to install a public address system in the new barracks now under construction.

The 1945th AACS Squadron facilities are under the command of Lt. Colonel Thomas N. Arnett. The squadron consists of 15 officers, 314 airmen, one DAF civilian, 90 Germans, and three field engineers, consultants on loan from private American firms.

The squadron is responsible for operation of the control tower, ground controlled approach, the radio range, and other navigational aids in the area, the operation of the AACS point-to-point radio facilities, and all teletype facilities relative to weather messages and to the movement of aircraft and administrative traffic.

Facilities operated by the 1945th AACS Squadron in the new building include the Air Force primary teletype relay station in Europe under the super vision of T/Sgt. Donald D. Tillery, CW point-to-point circuits supervised by S/Sgt. Clifford C. Billings, message center supervised by Sgt. James P. Evans, and cryptographic operations supervised by S/Sgt. Lester D. Livingston.

At the center direct circuits terminate from Washington, Greenland, Azores, Tripoli, Vienna, and all Air Force bases in Germany. Over six million words are transmitted each month from Rhein-Main to various points of the world.

AT&T Circuits Aid Jet Flights

The transatlantic radiotelephone service of the American Telephone and Telegraph Co. played a major role in maintaining control communications with the Atlantic jet plane flights September 22, it was revealed by the Air Force Communications Directorate.

Radiotelephone channels directly from the Air Force Communications main control room in the Pentagon in Washington, D. C., to England to Keflavik, Iceland, enabled constant radio contact, through relaying, to be maintained with the Air Force pilot through the jet's VHF equipment, aiding navigation between the starting point of the flight, Manston, England, and the emergency landing point at Limestone, Maine.

Because of poor radio propagation conditions at the Keflavik rendezvous point the two jets making the crossing had trouble refueling there, and one of the craft was forced to crash land before reaching another check point at the southern tip of Greenland.

NAVY

Ammon Nominated For Promotion

Capt. W. B. Ammon, USN, Assistant Director of Naval Communications, and one of the outstanding communications officers in the Navy, was one of 18 Navy officers whose selection for promotion to rear admiral by a Naval Selections Borad has been approved by President Truman.

Captain Ammon has held his present assignment of Assistant Director of Naval Communications since November, 1948. As yet there has been no disclosure as to any change of duty for him.

A comprehensive background of communications experience, both at the Navy Department and at sea, has featured the Navy career of Captain Ammon. In addition to his varied and important communications assignments in the Navy, Captain Ammon has had considerable general line duty in destroyers, cruisers and battleships. He also was a member of the first class to graduate from the National War College after V-J Day, completing a course during 1946 and early 1947.

In his communications service during World War II, and during the early postwar period, Captain Ammon served as communications plans officer in the Office of Naval Communications from 1943 to 1944. Then, in 1944 and 1945, he was Fleet Communications Officer under Fleet Admiral King. During 1947 and in early 1948 he was CinCPac Fleet Communications Officer.

Early in his Navy career, he took postgraduate work in communications engineering at the Naval Academy and Harvard University from 1928 to 1930. During the next four years, he served successively as communications officer of a destroyer, battleship, battleship division and scouting force. In 1934-36, he held the Fleet Communications desk at the Navy Department.

In his line of duty at sea, Captain Ammon has commanded the USS Madison, a destroyer (1941-42); the USS Panamint, an amphibious flagship (1945-46); and just before his present post as Assistant Director of Naval Communications, the USS Toledo, a heavy cruiser.

Gleim To Fifth District

Captain Fritz Gleim, USN, has reported for duty as commanding officer of the U.S. Navy Communication Station in the Fifth Naval District, it was announced early in October. Captain Gleim is also district communication officer on the staff of the commandant. He relieved Captain J. W. Stryker, USN, now on sea duty.

Captain Gleim has been on sea duty since December, 1948. Before that time he served in the Naval Communications Division, Office of the Chief of Naval Operations.

It's Admiral Graham Now

In last issue's item on Rear Admiral Roy M. W. Graham's retirement we neglected the matter of promotion coming at the same time and had Admiral Graham still in the rank of captain.

The rumor we reported then, that Admiral Graham had accepted a position with the Raytheon Manufacturing Company was correct, however. He is now assistant to the manager of the equipment sales division for that company, with specific duties in connection with harbor radar systems.

ARMY SIGNAL CORPS

CSO Returns From Korean Tour

The Chief Signal Officer, Major General Spencer B. Akin, returned in mid-September to his offices in the Pentagon after an inspection tour of the Korean war front. He was engaged in an intensive survey of the communications and radio equipment requirements and problems in that combat area.

Senior Signal Officers Confer

Senior signal officers from the Army's global communication system and commanders of major Signal Corps installations in the nation engaged the first week in October in conferences at the Pentagon with Major General Spencer B. Akin, Chief Signal Officer, and his top staff officers, principally on subjects raised by the Army's communications experiences in the Korean combat theater.

The conference also surveyed the plans and problems connected with the building up of communications services and equipment for the expanding military forces, together with the Army Pictorial Service's functioning in the present emergency.

High commendation for the combat photographers of the Signal corps during the Korean fighting for their "exceptionally fine still and motion picture coverage of armed forces activities in Korea" which constituted a "valuable contribution" in the success of the public information mission of the various services, was expressed in a recent letter to Brig. Gen. George I. Back, chief signal officer of the Far East Command, by Lt. Gen. E. H. Brooks, acting deputy chief of Army staff.

Those attending the Pentagon conference were:

Major General Francis H. Lanahan, commanding general, Fort Monmouth, New Jersey; Brigadier General Harry Reichelderfer, commanding general, Signal Corps Engineering Laboratories, Fort Monmouth, New Jersey; Brigadier General Rex V. D. Corput, Jr., chief signal division, EUCOM, Colonel P. A. Wakeman, signal officer, First Army; Colonel Arthur Pulsifer, signal officer, Second Army; Colonel R. P. Lyman, signal officer, Third Army; Colonel Carl H. Hatch, signal officer, Fourth Army; Colonel Glenn H. Palmer, signal officer, Fifth Army; Colonel Lloyd C. Parsons, signal officer, Sixth Army; Colonel Fred P. Andrews, commanding officer, Alaska Communication System; Colonel T. J. Tully, chief, Army section, JAMAG; Colonel Aubrey R. Morley, signal officer, U. S. Army, Caribbean; Colonel H. G. Miller, commandant, The Signal School, Fort Monmouth, New Jersey; Colonel Loren D. Pegg, signal unit survey group, Fort Monmouth, New Jersey; Colonel J. D. O'Connell, deputy president, Signal Corps Board, Fort Monmouth, New Jersey; Colonel R. A. Willard, commanding officer, Signal Corps training center, Camp Gordon, Georgia; Lieutenant Colonel Ralph D. McKinney, signal officer, U. S. Army, Alaska; and Colonel R. T. Nelson, Army field forces, Fort Monroe, Virginia.

Senior Signal officers conference at the Pentagon. L to R around the table, beginning at left foreground, are: Col. R. A. Willard; Col. Glenn H. Palmer; Col. R. P. Lyman; Col. P. A. Wakeman; Col. T. J. Tully; Col. R. T. Nelson; Brig. Gen. Rex V. D. Corput; Maj. Gen. Francis Lanahan; Maj. Gen. S. B. Akin; Col. Francis E. Kidwell; Brig. Gen. Harry Reichelderfer; Col. Aubrey R. Morley; Lt. Col. Ralph D. Mckinney; Col. Arthur Pulsifer; Col. Carl H. Hatch; Col. Lloyd C. Parsons.

Awards To Signal Personnel

The Department of the Army has announced the following awards to Signal Corps personnel: Legion of Merit to Captain Robert N. Kunz for outstanding service April 1944 to September 1945; Bronze Star Medal to Captain Douglas H. Berry for meritorious service November 1944 to June 1945; and Commendation Ribbon with Metal Pendant to Corporal Reese E. Merrick for meritorious achievement 28, April 1950.

Silver Star for Litz

Lieutenant Colonel Wayne P. Litz, Signal Corps, received the Silver Star in a ceremony at the Pentagon Building on August 28. Major General S. B. Akin made the presentation to Colonel Litz who was cited for gallantry in action on 13 June 1945 in Northern Luzon, Philippine Islands. At that time Colonel Litz was signal officer of the 37th Infantry Division.

While on a reconnaissance for the Division Commander in the town of Santiago, he became involved in the battle to secure the town before he could finish his mission. After completing the reconnaissance, he began the return drive to the division command post. As he approached Oriong Pass, he heard firing and on entering the pass found the enemy about to cut the division's axial road. Realizing the desperate situation, he determined to run the gauntlet of hostile fire. Pushing his vehicle to the limit, over the narrow twisting road, nearly blocked by disabled vehicles, he cleared the pass, and arriving at headquarters, reported the critical situation.

Colonel Litz was called into Army service in October 1940, while a member of the 145th Infantry, Ohio National Guard. He is now chief of the ROTC affairs section in the Office of the Chief Signal Officer.

Bronze Star Awards

Six Signal Corps officers and noncommissioned officers of the GHQ's advance liaison group have been awarded the Bronze Star Medal for their courageous efforts in maintaining communications during the early days of the Korean conflict.

The awards were made by Col. W. A. Speir, GHQ signal officer, on behalf of Brig. Gen. Geirge I. Back, Far East Command Signal Officer. The six Signal Corpsmen, who included two officers, beside establishing the first Army communications between Korea and GHQ in Tokyo, remained behind after the United Nations forces had been evacuated in order to destroy secret equipment so it would not fall into enemy hands.

The six men who won the Bronze Star Medal were: Capt. Lloyd G. Schuknecht, Jr., of Cedar Rapids, Ia.; 1st Lt. William H. Grady of Kenansville, N. C.; Sgt. Ralph Kruger of Joplin, Mo., and Richard L. Diamond of Columbus, O.; and Cpls. James C. Lynch of Detroit and Joseph Fratus of Provincetown, Mass.

Signal School Leads in Film Use

Reports from the field indicate that the Signal School leads ZI schools and training centers for the number of 16mm training film showings to Regular Army personnel. During the period 1 October through 31 December 1949, the film library at the Signal Corps Center, Fort Monmouth, N. J., reported 5,736 showings of motion picture films. The attendance was 239,495—an average of approximately 42 persons per showing.

New Field Wire Proved In Combat

Recently developed by the Signal Corps and now being produced in quantity by the telephone manufacturing industry, a new type military field communication wire, which is particularly suited to laying by air or by firing from a bazooka or rifle, is proving very effective in Korean combat operations, the Department of the Army has revealed. A companion item to the new wire is a lightweight dispenser, made of non-critical materials, using a wire coil to release wire at high or low speed without the use of reels or reel equipment.

The new military field communication wire represents a successful effort by Signal Corps engineers to combine the substantial talking range and other characteristics of standard field wire, with the reduced size and easy carrying of assault wire used by fast-moving troops in World War II. It has withstood all the rugged conditions of combat encountered in Korea.

The new wire can be laid at speeds up to 120 miles an hour from airplanes with good results, and can be released through the new dispenser by packboard from a soldier's back without use of his hands, from any land or amphibious vehicle, or from an airplane. Soldiers can also shoot it over rivers, lakes cliffs, or other obstacles.

The improved wire provides a talking range of approximately 12½ miles, and weighs about 46 pounds per mile. It consists of two conductors, each individually insulated and jacketed, and twisted together to form a light, flexible, flat-lying twisted pair. Each conductor is composed of three zinc-coated high-carbon steel strands and four tinned copper strands, all twisted together in a tight concentric bundle, covered by a tight-fitting cylinder of polyethylene—the new low-loss electrical insulation. A thin covering of nylon provides a tight waterproof container for the strands.

Two or more dispensers may be connected in tandem and the wire strung without splicing. For the laying of telephone wire by airplane, capacity containers have been developed which permit the laying of two continuous five mile circuits simultaneously from a plane in flight.

Walkie-talkie Much Improved

The walkie-talkie and handie-talkie radio units, which undoubtedly received more publicity than any other piece of communications equipment used in World War II, have undergone radical redesigning by the Signal Corps and are in the process of procurement, the Department of the Army announced Sept. 23. Goals achieved in the redesign of the portable radio sets, used in front-line combat in practically every area of the last global conflict, include reducing weight and greater talking clarity and versatility, the Army reported.

The new equipment, it was pointed out, is an outgrowth of the "integrated communications" concept laid down as a guide for Signal Corps engineering and tactical planning.

Integrated communications is aimed at giving all services engaged in the same tactical operation the means of being able to communicate with one another—the foot soldier with tank elements, artillery with supporting troops, and so on.

The new walkie-talkie, it was announced, weighs about 20 pounds, is 16 inches high, nine inches wide and three inches deep, or about half the dimensions of the World War II version.

The handie-talkie, although no smaller than its predecessor, it was pointed out, is a completely redesigned FM set and gives greatly improved performance. The new set, weighing about 6½ pounds, is shaped to be used like a large telephone hand set but also can be slung over the shoulder to be used by means of an attached handset.

Each of the new portable sets is a battery-operated receiver-transmitter in a single unit. The new walkie-talkie comes in three models, it was announced, for armored units, artillery and infantry. Differences in design are minor, however.

SC Expedites Crystal Processing

Because of urgent Army Signal Corps requirements caused by the present international situation, the Signal Corps has begun an expedited crystal processing program.

Approximately 4,000,000 crystals will be processed within the next ninety days with the work load equally distributed between the New Cumberland General Depot, Pennsylvania, and the Decatur Signal Depot, Illinois.

Sig Corps Radar Spots Storm Areas

Using recently devolped radar sets which can coordinate for the first time long range pictures of storms passing between strategically located radar weather stations, the Signal Corps Engineering Laboratories at Fort Monmouth, N. J., announced Sept. 17 that this research gives promise of new techniques which will enable instantaneous and more accurate spotting of hurricanes and other storm areas than has ever before been possible. The new technique of storm observations might lead to the establishment of a nationwide network of radar weather stations.

ROTC PHOTOGRAPHY CONTEST
See page 36 for details

Using a pair of the recently designed radar sets, it was pointed out that each station can take a picture of the storm from a different angle to give a truer picture of the contour, force, direction, and other highlights of the disturbance when these photographs are combined. By passing storm information from one radar station to the other without losing contact with the storm, a continuous check of a storm's progress anywhere in the country could be made. Fort Monmouth scientists asserted that use of such a network might eventually reduce to a minimum the hazardous spotting of hurricane paths by airplane checks, and that earlier warnings of hurricanes might be possible.

The range of the new radar is about 200-250 miles, and it was noted that the storms generally travel between 15-20 miles per hour. In addition to hurricanes other storms such as cold fronts, thunderstorms, and snow might be detected.

The nationwide network, it was cited by the Signal Corps, might permit weather experts to study the life cycle of a hurricane or other storm from the time it was spotted until it was spent. These ground radar stations could also guide planes and ships either away from of safely through storms. Cooperating with the Signal Corps Engineering Laboratories in the research are the Evans Signal Laboratories in Belmar, N. J., where the new radars were developed, and the Massachusetts Institute of Technology.

Civil Service employees at the Evans Lab have played a major role in the new radar development. Included in this group are John J. Slattery, supervising chief of the radar branch, William Gould, Albert Emurian, William Schiff, Francis Fisher, Lester Zurcher, William Iandiorio, and Joseph Weinstein.

PERSONNEL

Activities and Changes

Colonel Frank J. Schaal from duty in EUCOM was on temporary duty for a short time in mid-September in the procurement and distribution division of the Chief Signal Officer. Before returning to EUCOM he was to have visited the Sacramento Signal Depot.

Colonel Floyd T. Gillespie visited in the procurement and distribution division during the same period. Also from EUCOM he was visiting several

Signal Corps depots in the U. S. en route to his new assignment as commanding officer of the Sacramento (California) Signal Depot.

Colonel Emil Lenzner, formerly instructor at the Armed Forces Staff College, assigned to the Far East Command.

Colonel Edmund T. Bullock, formerly at the Boston Army Base, assigned to headquarters V Corps, Fort Bragg, North Carolina.

Promotions to Colonel:

Charles M. Baer, Charles H. Burch, Albert F. Cassevant, Steven S. Cerwin, Earl F. Cook, William H. Gaeckle, Thomas M. Hahn, Stanley M. Hankins, Marcellus R. Kunitz, John C. Monahan, Aubrey R. Morley, Arvo N. Niemi, Otto T. Saar, Robert E. Schukraft, Herbert L. Scofield, Kenneth S. Zitzman, Sidney S. Davis, George E. Kilpatrick.

Promotions to Lieutenant Colonel:

Donald L. Adams, Harry W. Berry, Guy M. Blencoe, Marvin C. Bowers, Maskell E. Brown, Bruce W. Caron, Walter R. Ewing, Merwin B. Forbes, James E. Foster, Bob H. Glover, Finis G. Johnson, John T. Custer, John P. McGovern, Marter D. Middleton, James R. Miller, Earl F. Mitchell, James D. Nutt, Brookman R. Painter, Halbert J. Slagle, Thomas J. Trainor, Alexander S. Quiner, Bruce H. Vail, Leonard F. Walker, Charles A. Wingo, Howard G. Annas, John S. Crull, Ralph G. Hagin, Orville V. Harold, Samuel S. S. Kale, Huston E. Maxwell, Wililam R. McTeranam, Russell C. Nelson, Arthur K. Ransom, Leo Tamamian.

Lieutenant Colonel OCSigO Assignments:

Walter A. Simpson to OCSigO; Ray M. Bagley to procurement and distribution division, OCSigO; John L. Leidenheimer to comptroller division; Jack N. Nahas to proceurement and distribution division; Charles F. Hoban (Res.) for fifteen days active duty training, Army Pictorial Service Division; Eric R. Osborne to communications service division; Gerald P. Lerner to procurement and distribution division; Angelo M. Ricciardelli to engineering and technical division; William F. Starr from Fifth Army to procurement and distribution division; William C. Boese (Res.) for fourteen days active duty training, engineering and technical division.

Lieutenant Colonel Luster R. Kleinknight was in the OCSigO for briefing by the procurement and distribtion division prior to his assumption of duties as deputy commanding officer, Signal Corps procurement agency, Philadelphia. Colonel Kleinknight's former duty was a executive to Brigadier General George I. Back, chief of the signal section, GHQ, FEC. He was called back from his assignment in Japan to take over his new duties in Philadelphia.

Shown at activation ceremonies Sept. 22 for two new Reserve Signal units in Philadelphia—the 9555th Organized Reserve Technical Service Unit Stock Control Agency and the Packaging Agency (9555th OR-TSU, Det #1), L to R: Col. A. Murphy; Brig. Gen. H. B. Hester; Brig. Gen. A. M. Shearer; Col. W. W. Watts, commanding officer, 9555th stock control agency; Lt. Col. H. L. Barnett, commanding officer, 9555th OR TSU, Det #1; and Lt. Col. S. S. Kale.

Promotions to Major:

Everett M. Amos, Harold W. Athan, Fred P. Baker, William D. Canfield, Jack H. Carter, Edwin J. Chatham, James P. Clark, Robert E. Covington, James L. Farmer, Raymond J. Gramont, Wilbur A. Hamilton, James Hantzes, Joseph F. Hardiman, Raymond F. Hoffman, Charles M. Hopkins, John E. Jenista, Ralph K. Jones, Leo P. Kane, Max Kapelowitz, Ralph R. Kenigson, Russell C. Kreuger, Jorge J. Lluy, Melvin L. Maxson, Jack W. McDonald, William J. McIntyre, Jr., Larry G. McPherson, James J. Moran, Richard R. Murray, Jennings Myers, Herbert D. Peterson, Rufus C. Prothro, Edwin T. Rhatigan, Beverly Risque, Nye M. Scofield, Carlyle H. Shurtleff, Willis E. Smitherman, Lloyd E. Snapp, Thomas B. Stacey, Gilbert D. Starnes, Lewis L. Taylor, Clark V. Telquist, Ralph N. Tudor, Harold F. Warren, James R. Windham, Christopher H. Wollenberg.

Assignments:

Major Duane B. Davis to career management branch; Captain John A. McKee to plans and operations; Captain Joseph M. Hite, Jr., to personnel and training; Captain Daniel W. Hancock to plans and operations; Captain David C. Baatz as Department of the Army representative on the subcommittee of the joint meteorological committee, replacing Mr. D. S. Miller; Captain Francis J. Schecher to procurement and distribution; Captain Estel E. Cohn and Captain Willis E. Stephens to personnel and training.

The CSO has announced the designation of Mr. Frederick H. Dickson as a Department of the Army associate member on the panel on antennas and propagation, electronics committee, research and development board. Mr. Dickson replaces Mr. Arthur R. Beach on the panel.

First Lieutenant Donald L. Lynes to administrative office.

Promoted to First Lieutenant:

Jack E. Brady, Joseph M. DeMarsche, Verne M. Gray, James F. Jones, William R. McCarthy, Charles R. Pack, Dallas M. Peyton, Harry O. Pierce.

Later Changes Received

Reporting to the Chief Signal Officer for duty: Colonel Amory V. Eliot, special assignment group (boards and committees), and Major Willard A. Muir, procurement and distribution division. Lieutenant Colonel Wesley C. Franklin has been assigned division signal officer, 4th Infantry Division, Fort Benning, Georgia.

Promotions: Second Lieutenants Joseph E. Corr, Jr., and Frank W. Clark, Signal Corps have been promoted to the grade of first lieutenant.

The following Signal Corps officers have been detailed to the Signal Corps junior military personnel board recently established in the Office of the Chief Signal Officer: Lieutenant Colonel Timothy H. McKenzie, chairman; Lieutenant Colonel Charles A. Wingo, vice-chairman; Majors Estill S. Thurston, Clarence O. Coburn and James L. Clark, members; and Major Charles J. Rehaeuser, secretary and member with vote. The board will review and make recommendations on personnel matters concerning warrant and company grade officers who are under the jurisdiction of the Chief Signal Officer.

RESERVE

321st Signal Op Btn Training

The 321st Signal Operations Battalion arrived at Fort Meade, Md. recently and began training in preparation for replacing the departed 51st Signal Operations Battalion.

Lt. Col. Lawrence G. LeFavour, a

veteran of 25 months overseas service during World War II, commands the battalion.

The 321st was designated as an Organized Reserve Corps unit in Detroit December 6, 1948. They conducted weekly training periods for 21 months until activated on September 11.

Colonel LeFavour was assigned to the 15th Air Force as a wing signal officer in Italy during the past conflict. All his officers in the 321st are also World War II veterans. Many are wearing ribbons for meirtorious service ans heroism; all of them are communications specialists.

The 321st began filling training assignments immediately upon arrival at Fort Meade and will soon be fully prepared to perform its combat mission of providing signal communications for a corps headquarters.

Bell System, Peace & War

(*Continued from page* 25)

rents over wires. Through the use of complex filtering apparatus, also developed by the Bell Laboratories, one high-frequency "carrier" telephone channel can carry several speech currents at the same time, and the various conversations can be sorted out at each end of the line.

It has been largely because of the development of carrier telephony — whereby more messages can be sent over relatively fewer physical conductors — that the Bell System has been able to furnish high quality long-distance telephone service at reasonable cost and to provide the circuits needed to meet unprecedented demands during and after the war.

An extremely important advance in communications was the application of the coaxial cable to telephony. A coaxial unit is basically a copper tube about three-eighths of an inch in diameter, with a single wire slightly larger than a pencil lead inside it. Several hundred telephone messages may be transmitted over two such units simultaneously. When properly equipped, the coaxial system carries television programs over inter-city networks.

In the last few years the Bell Laboratories has made tremendous advances in generating and detecting radio currents of higher and higher frequency. These microwave currents can be formed into highly directional beams, and by means of relay stations can be transmitted over long distances.

At the very high frequencies, there is little interference from static. The beams carry hundreds of telephone conversations or a television program.

Such a microwave radio relay system recently went into service between New York and Omaha. It utilizes a series of 54 stations between the two cities.

A network made up of both coaxial cable and radio relay systems now links major cities along the east coast and in the middlewest for the simultaneous broadcasting of the same television program. Similar facilities will be provided to increase the System's capacity to handle long-distance calls and make possible nation-wide television network broadcasting.

Some recent developments of the Bell Laboratories which promise great benefits to the field of communications are:

(1) The "transistor," a tiny and amazingly simple electronic amplifier based on an entirely new principle. This device can perform many of the functions of an ordinary vacuum tube and do other things besides. It seems destined for many applications in telephony.

(2) Miniature vacuum tubes, made with watchmaker's precision, to save space and power and with a longer service life. These will be used in radio relay, mobile telephone equipment, and other devices.

(3) A new handset telephone that has better hearing and speaking qualities, a bell that the customer can adjust for volume, and an easier-to-read dial.

(4) Voice amplifiers which will improve hearing on relatively long local-circuits and short toll-circuits.

(5) Crystals, both identical with those found in nature and of a synthetic variety. These are being "grown" in the laboratory to supplement the limited supply of natural quartz crystals used extensively in radio telephony.

Improvements and expansion of telephone service rest on a foundation of continuous research and contacts with customers. Even as new developments are being introduced by those in the field, scientists at the Bell Laboratories continue to open up still further opportunities for the years ahead, whether they be in peace or war.

The Radio Club at Norwich U.

A report of progress in signal communications made by the Signal Corps ROTC unit at Norwich University, Vermont

By Robert D. Sweeney
Sgt 1stCl, U. S. Army

During the academic year of 1949-50, the ROTC cadets at Norwich University, the 132-year-old military college in the heart of the Green Mountains of Vermont, organized the Norwich Radio Club which is now known the world over through the use of their amateur radio station W1QZE.

During the past semester the cadets talked with amateurs from all states of the union and some fifty foreign countries. Radio contacts have been made with at least one radio station on each continent. Station W1QZE has scheduled broadcasts with such faraway places as Ireland, England, France, Germany, Italy, Brazil, Japan, Russia, and many others.

The cadets have been designated by headquarters, First Army, Governors Island, New York, as the net control station for the Military Amateur Radio System (MARS) for the state of Vermont. MARS has served as a means of training the cadets in military and amateur radio operating, as well as serving as an emergency communication system in event of a local or national disaster. The cadets have been glad to help the local civilians during emergencies. In addition, over three hundred radiograms were sent in one week to servicemen through the MARS station.

The radio itself is composed of a high-powered radio transmitter and several standby receivers. Antennae are arranged in such a way as to beam radio signals in any direction.

The radio club is located in one of the large buildings on the campus. A spacious lounge room is available for study and relaxation. The walls of the clubroom are decorated with colorful amateur cards sent by other amateurs from all corners of the world. The club's radio shop, adjoining the clubroom, is used for experimentation in radio, electronics, and television.

Other outstanding accomplishments of the cadets have been the design and construction of television and FM antennae. They are now receiving television from a station some 150 miles away, becoming the first to receive FM and television in this section of the state.

Some club members designed and built their own television sets. Others are experimenting with miniature radio receivers and transmitters. One cadet has constructed a radio receiver in an aspirin case, and another in a standard fountain pen. Still another cadet built his amateur transmitter into a cigar box. This unit has all the necessary parts for transmitting on voice or Morse code. It radiates about two watts and has been heard by 20 different states at this writing.

Progress is being made toward establishing a broadcasting station on the campus through the use of a carrier system. Some of the universities throughout the country have had much success with this type of training. It is believed that Norwich will be the first small institution of its type to adopt this system.

At present the Norwich Radio Club is composed of some 40 members from the Cadet Corps. The club itself is operated under the supervision of the military and engineering departments of the school. Detachment 3, 1127th ASU is largely responsible for the success of the club. Use of the equipment of the military department enables members of the club to conduct experiments in radio, television, and electronics.

The "Big Noise"

(*Continued from page* 31)

cation on a single radio frequency, has been expanded to provide service between the United States and many other countries. This has greatly increased the traffic handling capacity of the circuits. At the present time RCA Communications operates over 80 direct circuits to more than 60 countries. It also operates more circuits equipped for automatic transmission than any other communications company operating in the United States.

In addition to radiotelegraph traffic, the circuits handle international broadcast programs, and the company provides radiophoto service between the U. S. and 28 overseas countries. Other special services include radio-teleprinter communications for the United Nations between Lake Success, Geneva and Paris; informational transmissions for the State Department; lease of radio-printer channels to American firms desiring direct communications with their offices abroad and the new two-way, customer-to-customer overseas radio teleprinter exchange service, TEX.

Post-war research had led to development of an electronic method of converting cable signals, widely used in British systems, into 5-unit characters for the RCA tape-transfer method of operation. This achievement substantially speeds the transfer of telegraph messages between British and American communications systems throughout the world.

Yes, thirty years ago the big, noisy, yet finely balanced Alexander alternator rolled on, day after day, for weeks and months on end, whirling to achieve new communications records. Today a piece of quartz and a glass bottle — the crystal and the vacuum tube—have taken up the burden of carrying the traffic load over short wave channels. The "big noise" still stands in the center of the floor at the Rocky Point station, seldom required, but ready to go.

Kellogg

(*Continued from page* 33)

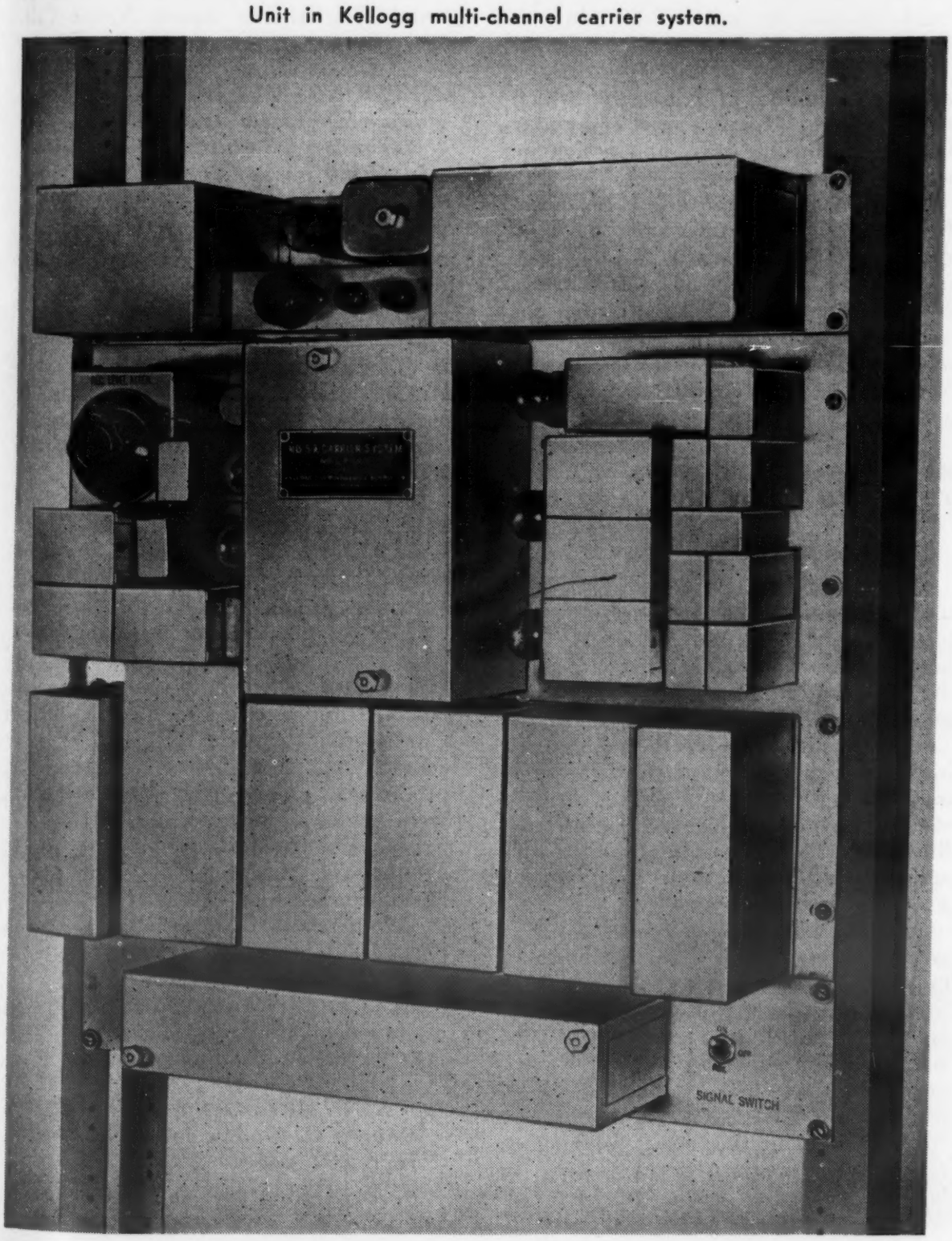
available now, because it meets all the probable demands of years to come.

Many business concerns have need for inter-communication service and multiple central office trunks. To meet such requirements Kellogg Key-BX is offered as the ideal branch exchange system. From one to six trunks are available, CB manual or dial exchange, serving up to twenty stations and one or two inter-communication circuits for use between individuals or for conference calls. No attendant is needed, as each person has a Key-BX box on his desk. Any station may hold, answer or transfer a trunk call. Conference connections are easily arranged. This service offers a fine opportunity for the rental of equipment.

A real "universal circuit" is the term applied to Kellogg's Cordless PBX, and it seems to fit because the claim is made that it is the only switchboard that may be used on common battery, manual or dial, or magneto main exchanges, without tedious and expensive changes. A universal circuit makes possible either through or blocked supervision, changing one to the other easily and quickly. The operator has complete control over all calls.

Such a brief survey cannot do justice to the extensiveness or quality of the Kellogg line. It may be said, however, that the name stands for distinguished service in the independent telephone field, and for future achievements excelling even those of past years.

Unit in Kellogg multi-channel carrier system.



Electronic Accounting

(*Continued from page* 22)

ture. Because of the urgency of the war situation, the computation of firing and bombing tables was a vital link in delivering weapons, ammunition and fire-control equipment to the battlefronts.

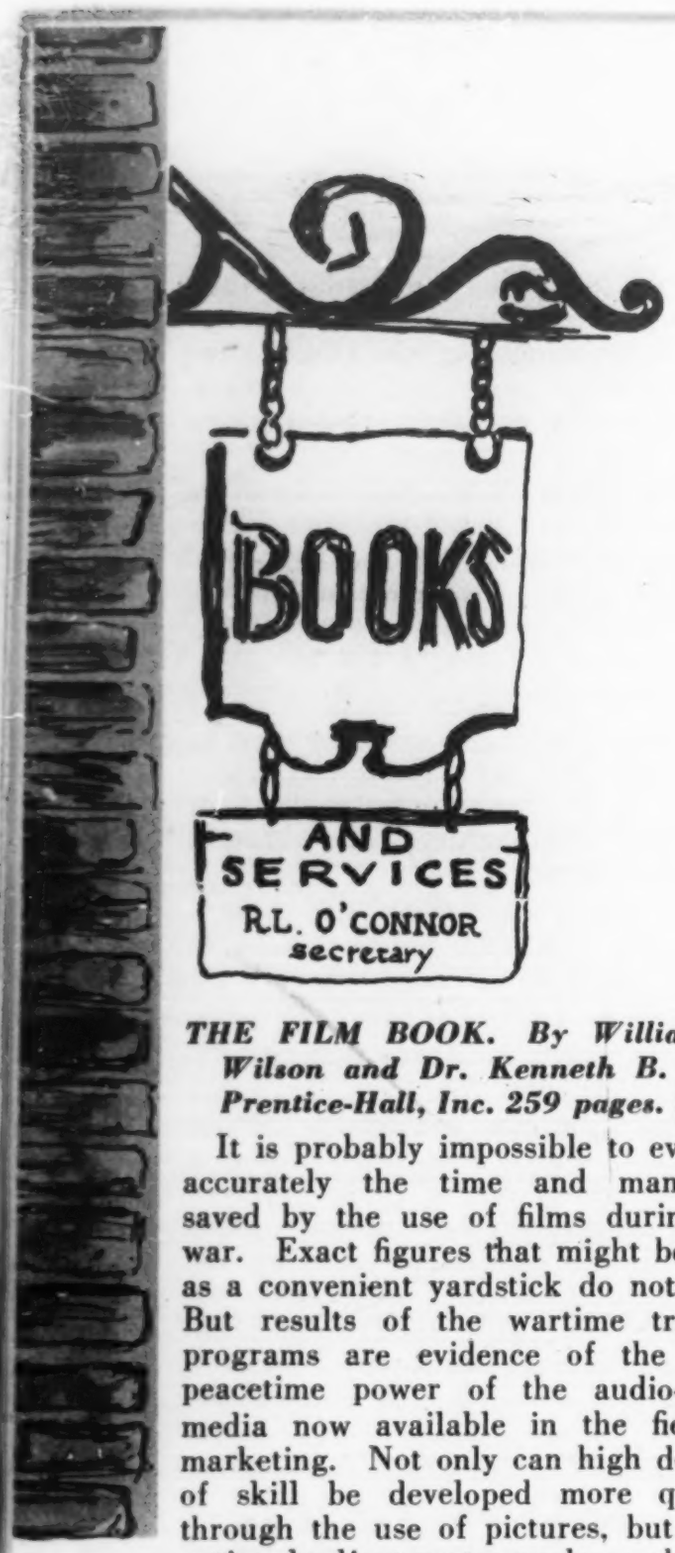
It was clear that speedier calculating methods were needed. In the spring of 1943, the Ordnance Department authorized the development of an electronic computing machine — the Eniac — by the Moore School staff. This revolutionary aid to man's thinking was completed in the fall of 1945.

Significantly, the first problem to be put on the Eniac was a calculation pertaining to nuclear physics. With previously existing equipment, it would have required about 100 man-years of work by trained computors.

Eniac obtained the solution in two weeks, of which about two hours were required for the actual electronic computation, and the remainder of the time for details of operation and review of results.

Successful operation of the Eniac marked the opening of a new era of extremely high-speed, low-cost computation available only through electronic equipment. It demonstrated the practicability of such methods for certain highly mathematic problems. Could a

(*Continued on page* 64)



National Best Sellers

Compiled on a Percentage Basis from the Reports of 63 Booksellers as listed in Publisher's Weekly for September 16.

FICTION

1.	The Cardinal, *by Henry Morton Robinson*	$3.50
2.	World Enough and Time, *by Robert Penn Warren*	$3.50
3.	Jubilee Trail, *by Gwen Bristow*	$3.00
4.	The Legacy, *by Nevil Shute*	$3.00
5.	White Witch Doctor, *by Louise A. Stinetorf*	$3.00
6.	The Wall, *by John Hersey*	$4.00
7.	Two Adolescents, *by Alberto Moravia*	$2.75
8.	Star Money, *by Kathleen Winsor*	$3.00
9.	Homeward Borne, *by Ruth Chatterton*	$3.00
10.	The Egyptian, *by Mika Waltari*	$3.75

NONFICTION

1.	The Little Princesses, *by Marion Crawford*	$3.50
2.	The Mature Mind, *by H. A. Overstreet*	$2.95
3.	Courtroom, *by Quentin Reynolds*	$3.75
4.	Dianetics, *by L. Ron Hubbard*	$4.00
5.	Look Younger, Live Longer, *by Gayelord Hauser*	$3.00
6.	Worlds in Collision, *by Immanuel Velikovsky*	$4.50
7.	John Adams and the American Revolution, *by Catherine Drinker Bowen*	$5.00
8.	Behind Closed Doors, *by Admiral E. M. Zacharias*	$3.75
9.	Roosevelt in Retrospect, *by John Gunther*	$3.75
10.	Eleanor of Aquitaine and the Four Kings, *by Amy Kelly*	$5.00

THE FILM BOOK. By William H. Wilson and Dr. Kenneth B. Haas. Prentice-Hall, Inc. 259 pages. $4.65.

It is probably impossible to evaluate accurately the time and manpower saved by the use of films during the war. Exact figures that might be used as a convenient yardstick do not exist. But results of the wartime training programs are evidence of the great peacetime power of the audio-visual media now available in the field of marketing. Not only can high degrees of skill be developed more quickly through the use of pictures, but occupational adjustments can be made with ease, desirable attitudes can be created, and knowledge can be more effectively conveyed.

The Film Book gives complete information on how to obtain, produce, use films. Detailed information is given on preparation, techniques, costs and distribution and is clarified by how-to-do-it illustrations and diagrams. You will find in it helpful tips on every step of film production.

The amazing impact of television now demonstrates the limitless potentialities for increasing popular knowledge by visual presentation. And of all known visual aids motion pictures and slide films have established the most impressive record.

TELEVISION: The Eyes of Tomorrow. By William C. Eddy. Prentice-Hall, Inc. 380 pages. $3.75.

This is an unusual book in that every word of it is readable for the layman, while dealing with a subject usually treated in such technical detail that only engineers can understand it. And not only is the book readable for anyone, but it is highly enjoyable.

The author, a U. S. Navy captain, has been associated with television from its infancy. In 1934, retired from active duty because of deafness, he was introduced to television by pioneer Philo Farnsworth, and shortly afterwards he became chief of video effects for NBC's television outlet in New York. In 1940 Captain Eddy went to Chicago and for a Paramount Pictures subsidiary built television station WBKB. A year later critics rated it America's No. 3 tele station, topped only by CBS and NBC. The day after Pearl Harbor he was on his way to Washington where he argued Naval authorities into letting him organize the training schools in Chicago which turned out the Navy's radio and radar technicians for the war, and which he commanded thereafter.

In his book Captain Eddy sketches the highlights of television development, stressing especially the last decade, and he describes in simple terms the operation of television from the camera to reception on the home set. He concludes with some humorous "tele tall tales" from his personal experiences.

RADIO COMMUNICATION AT ULTRA HIGH FREQUENCY. By John Thomson. John Wiley & Sons, Inc. 203 pages. $4.50.

Since World War II much has been written about the use of the UHF part of the spectrum for radar, but little has been published in book form regarding the corresponding advances which have taken place in radio communication.

The potentialities of the new ultra high frequency techniques are fascinating, and in the U. S. have already reached some measure of fulfillment. Both sound and vision broadcasting may radically alter their character as a result of these developments.

Already mobile radio services such as those required by the police and by coastal shipping have become practical propositions, while point-to-point multiplex telephony, television relays, and color television are even now contesting for the use of the ultra high frequency bands.

The author of this book provides an account of modern developments in higher frequency work, and has attempted to write in terms intelligible both to the radio student and to the practising communication engineer. He suggests that the devices described may also be of value to workers in other electronic fields.

John Thomson, M.A., D.Sc., F.Inst.P., is professor of physics and electrical engineering at the Royal Naval College, Greenwich, England.

LETTERING: The History and Technique of Lettering as Design. By Alexander Nesbitt. Prentice-Hall, Inc. 320 pages. $6.

If you have anything to do with lettering of any kind this book is the best in the field that you can have in your library. We enthusiastically recommend it.

Mr. Nesbitt's writing and collection of illustrative material will almost assuredly make his book, both from an historical and practical standpoint, the standard authoritative work on lettering and design.

In this distinguished work the author traces the evolution of graphic design from the earliest crude symbols of antiquity, through every step of development, to present day modern design. He follows the story of lettering down to the great variety of type styles in general use today, telling how each was invented and adapted to meet a particular need in graphic design. The accompanying illustrative plates, the products of many years' work are masterpieces of their kind.

Like Mr. Nesbitt's work as a calligrapher and designer, his book is a craftsmanlike job, patently the work of a remarkable talent. His talent is backed up by a 30-year record of experience in practicing and teaching the graphic arts. During the war he concentrated on producing technical drawings for the armed forces.

ROCKET DEVELOPMENT. By Dr. Robert H. Goddard. Prentice-Hall, Inc. 291 pages. $6.50.

At Dr. Goddard's death, in 1945, he left behind a voluminous collection of

notes, records, photographs, patents, ideas, and experimental data, representing a remarkably active lifetime of devotion to a single purpose; the development of liquid-fuel rockets for practical purpose. Though his achievements were widely known among technical men, none of his experimental data, and little of his other material, has been made public until now, except his numerous patents and two brief progress reports.

The purpose of this book is to present, for the first time in print, the Goddard data on experiments from the time of Dr. Goddard's now historic liquid-fuel rocket flight of July 17, 1929 at Auburn, Mass., until his acceptance of an assignment to carry on experimental rocket work for the United States Army and Navy at the beginning of World War II.

It is interesting to note that as early as 1899 Dr. Goddard began to speculate on the possibility of employing rockets for the physical exploration of the upper region. And in 1907 he prepared and submitted for publication a manuscript presenting his theories on such use of the rocket. The manuscript was refused by the science publications of that period.

BASIC MATHEMATICS FOR TECHNICAL COURSES. By Clarence E. Tuites. Prentice-Hall, Inc. 475 pages. $5.

This book provides the mathematical training that is pertinent and essential in the study of technical subjects. It was written from the viewpoint that mathematics in the technical field should be a means to an end rather than the end itself. Since the theory of mathematics is combined closely with use, applications in the solution of practical problems have been given prominence.

Representative problems from the various technical fields have been selected so that a student with a particular interest in one of these fields may be given an assignment of practice problems illustrative of the use of mathematics in his chosen field.

The material in this book was developed at the Rochester Institute of Technology and was used for several years in mimeographed form by the author in his classes at that institute. It was selected by the publisher as one of a series of textbooks designed for technical institutes and the junior college field. It should be useful also in industrial and extension schools and to those who must depend upon self-study for the continuation of their education.

CREATIVE BROADCASTING. By H. J. Skornia, Robert H. Lee, and Fred A. Brewer. Prentice-Hall, Inc. 407 pages. $6.

All the problems and procedures of creating a radio broadcast are presented in this absorbing learn-by-doing book. For those who will make radio their careers the book provides a sound, practical introduction to future study.

Creative Broadcasting will be equally valuable for groups with little equipment and those who have their own station outlets. There are numerous illustrations and diagrams of the physical layout of studios, microphone placement for different programs, and other practical information.

The development is from short, simple scripts to long, complex productions with an increasing emphasis on creative contribution by the group. Part I gives the theory and practice of preparing a broadcast, and Part II contains twelve non-copyrighted, royalty-free scripts. These latter are worth the price of the book alone.

Insignia of the Association

AVAILABLE TO MEMBERS FROM THE SERVICE DEPARTMENT

The Association insignia in several beautiful designs and convenient styles authorized for wear by members is available at the prices quoted below. Order from AFCA Service Department, 1624 Eye St., N. W., Washington 6, D. C. The insignia is described as follows:

The central figure is an alert powerful American eagle with strong talons clutching lightning flashes—symbolic of a strong America and national defense—especially insofar as modern communications is concerned, our basic reason for existence. The border consists of leaves of the olive branch of peace, showing that the object of military preparedness in America is to assure a lasting peace. In the background are signal flags—the first means of signalling in sea and land warfare by United State forces. Just above the eagle and between his outstretched wings is a heavy bomber in flight, symbolizing the complicated and essential communications in the Air Force, and in Naval and Marine aviation. Above that is a radar antenna array, and at the very top a radio rely antenna—for the latest major step in military communications. And none of these could exist without industry—the foundation of AFCA. In the color version there are the traditinal colors of the signal flags—dexter white with red center and sinister red with white center—with a gold border to the whole.

Members should take every opportunity to display AFCA insignia. Worn on the uniform or civilian dress, or displayed on home or office wall, it carries with it an identification of distinction, is decorative, and helps to widen the scope of our Association by bringing it to the attention of others. Emblem is available in a variety of attractive forms.

ASSOCIATION MEDAL

Wrought on the medal in sharp and bold relief is the AFCA insignia. 1⅜ inches in diameter (shown at the right, actual size), the medal is suspended from a ribbon of heavy grosgrain silk in orange and dark blue. The medal is authorized for wear on the uniform as provided in A.R. 600-40, paragraph 68g and 70c (2) (dated 31 March 1944). Prices: $3 in bronze, $4 in silver, $5 in gold. Medal is not available for sale to student members.

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10-K Gold	5.00 (including tax)

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DECALCOMANIAS

Your Service Department has arranged to have decals made of the association insignia, and these will soon be available to you at nominal cost. In full color, these decals can be transferred from either side to any solid surface so that the insignia will appear to have been painted on that surface.

Watch for decal sale announcement in this space.

Our Book Department can furnish any book currently in print. We will also help to secure older titles that you may need to complete your library. A 10% discount is allowed all Association members on orders of $2.50 or more. Please indicate author and publisher where known, and allow three weeks for procurement and delivery.

Electronic Accounting

(*Continued from page* 61)

simpler, more versatile machine be developed that would be useful in many other applications?

By September 1945, plans were outlined for just such a machine, the Edvac. Where the Eniac could operate with only twenty ten-digit numbers, the Edvac could store 1000 such numbers at once, electronically, eliminating handset switches. Instructions could be changed automatically in seconds, instead of hours.

The third machine of the series, the Binac, was constructed in 1947 by the Eckert-Mauchly Computer Corporation, now a subsidiary of Remington Rand Inc. A small compact, high-speed computer, the Binac was developed especially for the rapid solution of complex mathematical problems confronting the Northrop Aircraft Company. Actually, Binac consisted of two identical computers, one checking the other and each using a mercury memory system to store data.

Out of the experience gained in building the Binac, came the Univac (universal automatic computer), announced in April 1950, and now being manufactured by Remington Rand as a business administration aid.

The Univac represents a completely new and uninhibited approach to the overgrowing problems of commercial, scientific, and governmental organizations. Its functions extend beyond pure computation, since it can classify and arrange both decimal and alphabetical information. It is unsurpassed in handling great volumes of raw sources data which must be cataloged or processed in accordance with certain logical arithmetical rules. It is also suited to relatively small quantities of source data which are subject to extremely complex mathematical sequences.

Since the Eckert-Mauchly Computer Corporation, which is headed by Univac's two inventors, has become a Remington Rand subsidiary, its research and development activities have been coordinated with the practical electronic research for business that has been long under way at the company's laboratory of advanced research at South Norwalk, Connecticut. The objective is to produce not merely solutions to interesting academic problems, but new means to help the businessman meet the constantly increasing complexities of industrial and commercial operation.

INDEX TO ADVERTISERS

(Advertising Agency Shown with Advertiser)

Naval Electronics

(*Continued from page* 11)

program. This is true not only in the Navy but in private industry as well. The Navy has developed during the past years an extensive world-covering logistics program for electronic parts and material. The central point in this organization is located at Chicago, Illinois, in the office of the electronics supply office. This office operates under the technical control of the Bureau of Ships and under the management control of the Bureau of Supplies and Accounts.

The office is charged with the inventory control of electronic maintenance repair parts for Bureau of Ships equipment. Fundamentally, this merely means the providing of parts required for the maintenance of equipments when and where demand arises. It is merely a matter of knowing what parts comprise each equipment, how many equipments there are in use, the location of those equipments, and the rate at which the several parts are consumed or will be required.

Only within the last few months have there been adequate parts lists of equipments and equipment inventories that could be applied to this problem. In addition, many parts that were provided in the spare parts boxes (supplied by manufacturers with the equipment) at time of acquisition were not properly identified or stock numbered, and many parts were never provided. This is understandable due to the crash nature of many programs during and immediately after the war.

However, these conditions confronted the Navy with a tremendous problem. The development of adequate parts lists is going forward, the proper identification of all parts progresses, the introduction into the system of parts in spare parts boxes continues, the application of failure data to the equipment application and population is coming into being with the end result that eventually the electronic supply system will be able to have available to the maintenance personnel a much more intelligent span of parts than at present.

Maintenance is completely ineffective without proper supply. Proper supply is dependent upon the factors indicated above, plus information from those involved in maintenance, operation, equipment development and procurement. As supply is vital to maintenance, so is information from all sources vital to supply.

It is with pardonable pride, therefore, that the Naval electronics organization views the accomplishments made in all fields related to the electronics program. Maintenance information from those engaged in actual work has proven invaluable to those engaged in basic research and design. This information has aided in the elimination of weak components, unsatisfactory units, and in many cases complete discard of entire equipments and systems which were proven unreliable or unsatisfactory.

Actual field trials by engineers and scientists from the Bureau of Ships and the laboratories have been highly instrumental in cutting down time between breadboard design and finished product, between initial trials and eventual acceptance or rejection of a mass of electronic equipment. The supply organization has grown with this growth in the technical field and the net result is a far more efficient Naval electronics organization at the present time than was ever anticipated in the preceding years.

Early American Gunsmith . . .

Arming the soldiers of "young "America was a formidable task for the new, untried nation. Each musket, the weapon of the day, was laboriously made by hand . . . and repaired by hand.

It was Eli Whitney, Massachusetts-born Yale graduate, who showed the way to improvement. In 1798, he undertook to supply the U.S. Army with the unheard of quantity of "10,000 stand of arms" to be delivered within two years—a commission beyond the imagination of the most skilled mechanists of the day. To do this Whitney developed the concept of interchangeable gun parts wherein "the several parts were as readily adapted to each other as if each had been made for his respective fellow." History shows that Eli Whitney succeeded and from this humble, little-remembered beginning the new era of mass production was underway.

In the electronic, radio, and electrical fields alone, Sprague has done much to arm *modern* America. Of some 10,000 different component design variations produced each year, many are produced by the millions. But most important, like Whitney's interchangeable weapons, each component of a given type maintains its particular characteristics to an outstandingly high degree of uniformity.

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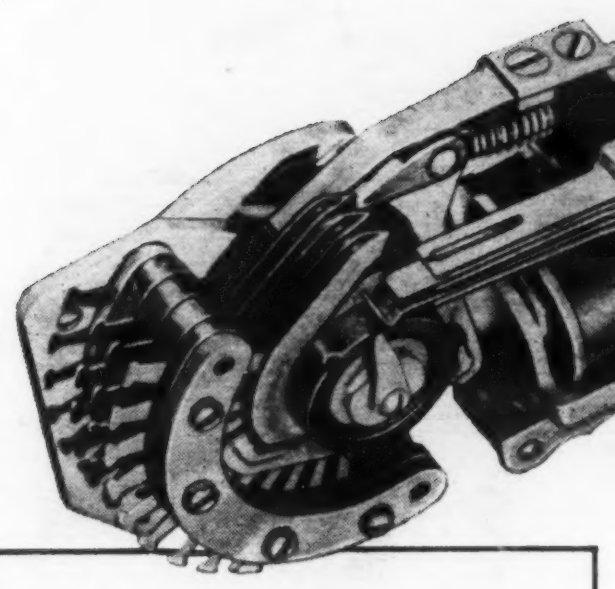

THE TYPE 44

Miniature Rotary Stepping Switch

An amazing switch! So small it fits in the palm of your hand. Light in weight, too, averaging a mere 14 ounces. Accommodates up to 6 bank levels, each with 10 points plus "home." Can be arranged for 10, 20, or 30 point operation. On 48 volts d-c, runs self-interrupted at 80 steps per second; impulse-controlled at 35 steps per second. Life tested for 200,000,000 steps—and then required only slight readjustment for continued operation. Illustrated directly above.

THE TYPE 45

Rotary Stepping Switch

The finest of its kind for d-c service—and the only one that's completely self-contained for a-c service. Accommodates up to 10 or more bank levels, each with 25 points plus "home." Can be arranged for 25 or 50 point operation. On 48 volts d-c or 115 volts a-c, runs self-interrupted at 70 to 75 steps per second; impulse-controlled, at 35 steps per second. Life tested for 200,000,000 steps—then required only slight readjustment for continued operation. Illustrated at right above.

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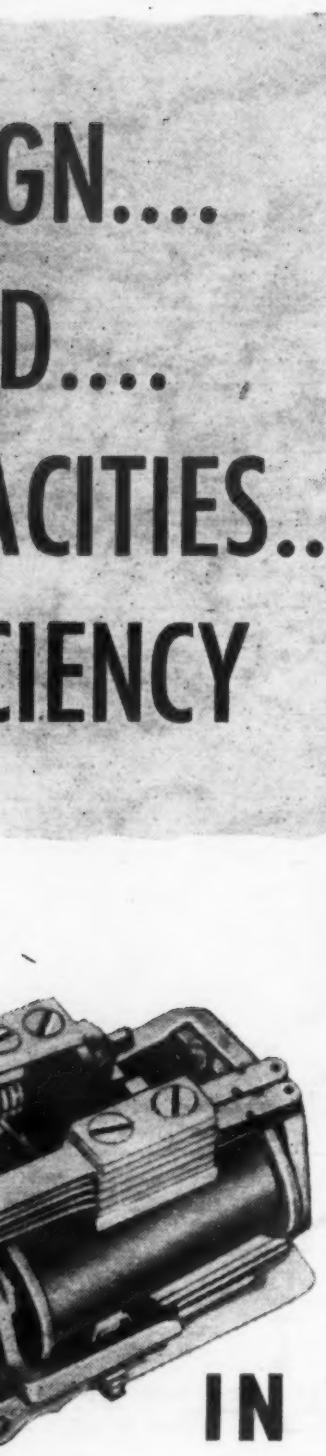

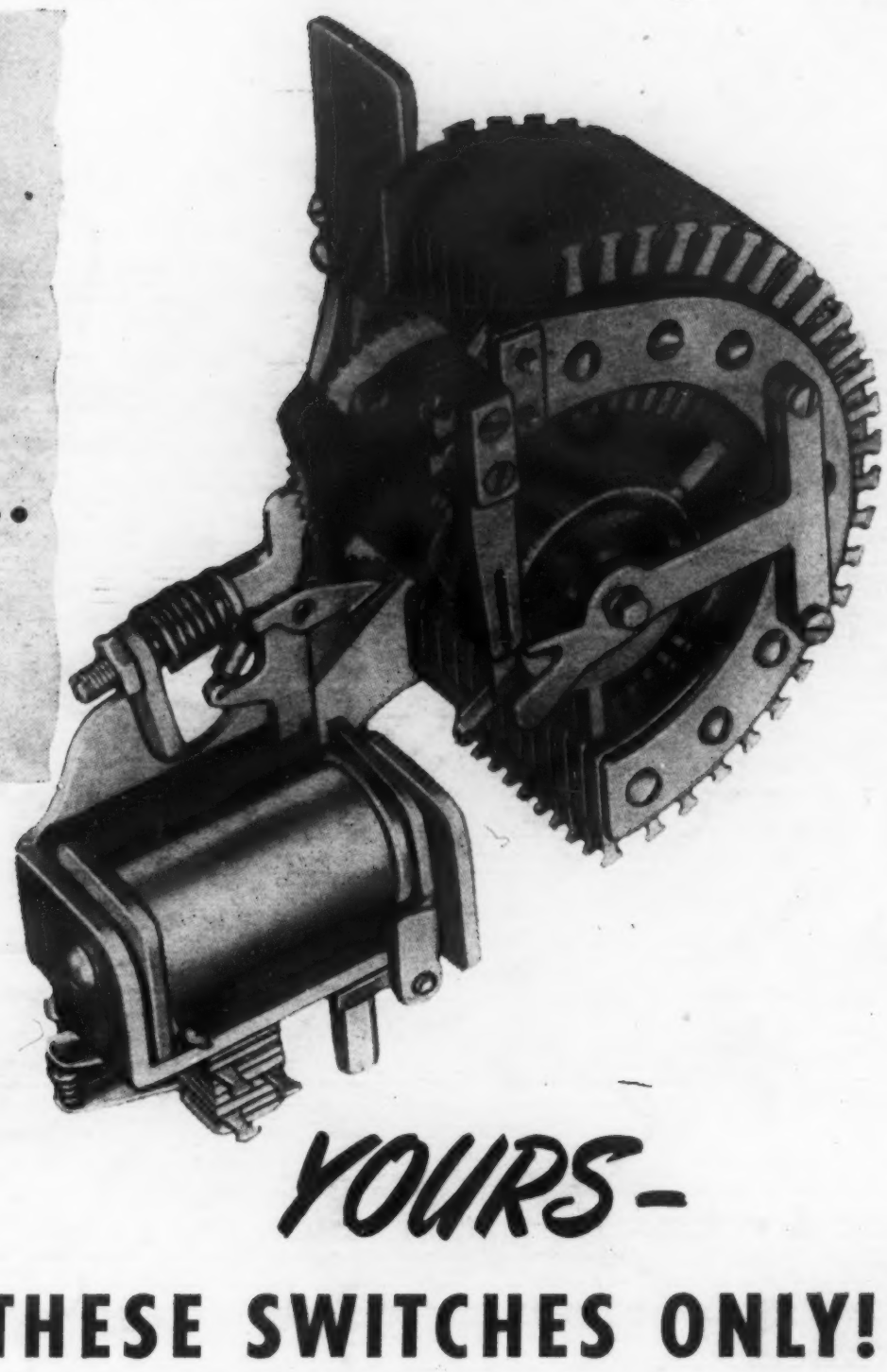

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totalizing operations—
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In all of these, and in many other applications, you can rely on these switches for smoother operation with faster stepping and positive stopping. Conventional adjustments have been eliminated, too, reducing maintenance during the longer life provided.

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